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Aquatics Resources Report

Lake Mountain and Middle Tompkins Allotment Management Project

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Siskiyou County, California

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Overview of Methodology

Methodology for the analysis includes field review, literature and current research review, GIS analysis, and local expertise for the consideration of direct, indirect, and cumulative effects. Field reviews and surveys were conducted in 2012, 2013, and 2014.

Analysis Indicators

The analysis of the potential effects to fish and their habitat is organized by direct and indirect effects and by effects to seventeen Indicators of anadromous fish habitat conditions. The Indicators originate from the "Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area" (USDI, USDA, and NOAA 2004). Effects of project elements to an Indicator may be neutral (no effect), discountable (extremely unlikely to occur), insignificant (effects are not able to be meaningfully measured, detected, or evaluated), or significant (effects able to be measured). Furthermore, effects may be either positive or negative. After the appropriate Indicators have been evaluated, the resulting information is used to determine overall effects on aquatic species, including Coho Critical Habitat and Essential Fish Habitat.

The following Indicators are potentially affected by Project elements, and therefore will be included in the subsequent analysis:

- Temperature
- Turbidity
- Chemical Contamination/Nutrients
- Sediment/Substrate
- Streambank Condition
- Peak/Base Flows
- Disturbance History and Regime

Although the methodology for effects analysis only technically applies to anadromous fish potentially within the Project area (e.g., Coho, Chinook, and steelhead), it may also be used for resident rainbow trout to ensure a consistent assessment of fish species. Furthermore, indirect effects to anadromous fish serve as a proxy for lamprey. Indicators are used to assess the existing environment of anadromous systems, with each Indicator labeled as to if it is "Properly Functioning," "Functioning-At-Risk," or "Not Properly Functioning" for a given stream.

Focus for analysis will be upon aquatic emphasis areas. Aquatic emphasis areas are meadows and other locations that receive medium or high levels of grazing and contain cattle-accessible stream channels. Most streams of the action area are inaccessible to cattle due to steep topography and difficult footing. There are few wet meadows, and many of these areas do not have defined stream channels, only high water tables. Therefore, aquatic emphasis areas are the locations where potential aquatic impacts from the Project would originate.

Spatial and Temporal Context

The analysis area for aquatic resources includes effects at the site-specific and watershed-scale extent, with a focus upon aquatic emphasis areas.

Watersheds utilized in the analysis are at the 5th- and 7th-field level.

Site scale effects to aquatic resources are not expected because no aquatic emphasis areas occur within or immediately adjacent to fish habitat. Furthermore, there will be no exposure of vulnerable life stages – eggs and nonmobile hatchlings – to trampling. Indirect effects associated with grazing within aquatic emphasis areas, as well as upon the general landscape, may occur as at the 7th and/or 5th field watersheds scale.

Temporal analysis timeframe includes effects during implementation, short-term effects expected to occur within the first year following implementation, and long-term effects (greater than one year).

Affected Environment

The Lake Mountain and Middle Tompkins Allotment Management Plan Project is located largely within drainages east and south of Lake Mountain lookout; and west and southwest of the community of Scott Bar, CA. The Lake Mountain Allotment encompasses several small fish and fishless drainages to the Klamath River. Within the Middle Tompkins Allotment, Tompkins Creek and Middle Creek are the primary watersheds, although there are small headwater inclusions of streams which drain west towards Grider Creek. Anadromous systems potentially affected by Project activities include Grider Creek, O'Neil Creek, Rancheria Creek, Tompkins Creek, Scott River, and Klamath River. Additional fish-bearing (resident rainbow trout) streams are Fish Creek, Kuntz Creek, Macks Creek, Middle Creek, Mill Creek, Mitchell Creek, and Tyler Meadow Creek. Critical Habitat (for Coho) and Essential Fish Habitat (for Coho and Chinook) have been delineated for each stream where applicable.

Summary of actual and potential occupancy by analysis species of creeks/rivers within 7th- and 5th-field watersheds.

Species	7th-Field													5th-Field	
	Klamath River	Scott River	Grider Creek	Fish Creek	Kuntz Creek	Macks Creek	Middle Creek	Mill Creek	Mitchell Creek	O'Neil Creek	Rancheria Creek	Tompkins Creek	Tyler Meadow Creek	Lower Scott River	Seiad Creek-Klamath R
Coho	X	X	X							X		X		X	X
Chinook	X	X	X							X		P		X	X
Steelhead	X	X	X			P				X	X	X		X	X
Resident Rainbow Trout	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Pacific Lamprey	X	X	X			P				P		P		X	X

Klamath River Lamprey	X	X	P			P				P		P		X	X

X - confirmed presence
P - potential presence

Environmental Consequences

Alternative 1 – No Action [No Grazing]

Direct Effects and Indirect Effects

Under the No Action alternative, livestock grazing will be discontinued on Lake Mountain and Middle Tompkins allotments. Connected actions, such as the Lookout Spring redevelopment and Faulkstein Camp Meadow exclosure construction, will not occur.

There would be no direct effects to fish or fish habitat.

Lake Mountain Allotment

Indirect effects as examined under Alternative 2 would cease. Of the Indicators discussed, only “Chemical/Nutrients” and “Disturbance History/Regime” apply to Lake Mountain Allotment for this alternative. Because livestock-associated nutrient input would no longer occur, there would be insignificant positive effects of this Indicator to aquatic emphasis areas above fish habitat, although effects downstream in fish occupied reaches would not be expected to be meaningfully detected. Similarly, the baseline for the ERA model would be adjusted to reflect cessation of grazing, although the beneficial impact would be so small as to be indiscernible from natural background variability.

Middle Tompkins Allotment

Middle Tompkins Allotment has not been grazed since 2007, and, therefore, removal of livestock would not alter the existing condition. Consequently, this Alternative will not result in any indirect effects to this allotment, beneficial or adverse.

Cumulative Effects

There will be no cumulative adverse impacts to fisheries resources from the No Action Alternative. Without direct effects, and either beneficial or no indirect effects, there cannot be adverse cumulative effects.

Lake Mountain Allotment

All insignificant beneficial effects are restricted to Lake Mountain Allotment because only this allotment would undergo management change to discontinue grazing. Without direct effects, and only beneficial cumulative effects within the footprint of future foreseeable actions, there cannot be adverse cumulative effects.

Middle Tompkins Allotment

Middle Tompkins Allotment has not been grazed since 2007, and, therefore, removal of livestock would not alter the existing condition. Consequently, this Alternative will not result in any indirect effects, unlike the Lake Mountain Allotment. Without direct or indirect effects within the footprint of future foreseeable actions, there cannot be cumulative effects.

Alternative 2 – Proposed Action

Direct Effects and Indirect Effects

There will be no direct effects to fish or fish habitat.

Indirect effects may result from the livestock grazing component of the Project, including active herding of animals between pastures. Most effects will either not be discernible above existing background processes, else will impart localized effects within aquatic emphasis areas above fish habitat, with effects within fish occupied reaches not discernible. Where impact to fish or habitat does have the potential to occur, it will be temporary, localized, and considered insignificant.

Temperature - Any localized impact to water temperature would be negligible and not biologically meaningful in downstream fish-bearing reaches because the closest aquatic emphasis area to Coho and Critical Habitat is 1.9 miles; to anadromy is 1.1 miles; and to resident rainbow trout is 0.4 miles.

Turbidity and Sediment/Substrate - The turbidity and substrate Indicators are discussed together due of their close relationship.

Localized occurrence of raw banks resulting from livestock grazing may occur within aquatic emphasis areas. Where bare banks are observed, turbidity will be of short duration and spatially limited; and any changes to substrate composition will be localized and not propagate downstream. Alders were removed adjacent to the 46N64 bridge over Tompkins Creek to improve access for water drafting during 2014 fires. Until the alder recover, there is a higher probability livestock will trail through the creek, thereby producing a temporary increase in local turbidity as animals disturb streambanks and stream substrate. Active herding will insure that livestock stream access will be minimized. With the exception of the site at the 46N64 bridge, the closest aquatic emphasis area to Coho and Critical Habitat is 1.9 miles; to anadromy is 1.1 miles; and to resident rainbow trout is 0.4 miles. All aquatic emphasis area distances are well beyond those where that turbidity or fine sediment mobilization would be detectable.

Chemical/Nutrients - While there may be areas where nutrient impacts of Project cattle grazing are expected to be detectable, these will be associated with aquatic emphasis areas, which are distant from fish or fish occupied habitat. Elsewhere within the allotment, and especially in association with Tompkins Creek Critical Habitat, there is very low possibility of nutrient input. Expected uptake of nitrogen and phosphorus by local biota means that nutrients will remain below the level of ecological concern, thereby not contributing to enrichment of areas affected by pathogens such as the Klamath River.

Streambank Condition - Except for the 46N64 road crossing, no streambank impacts within fish habitat, including Coho Critical Habitat, are expected. While there is potential for localized bank impact within aquatic emphasis areas, impacts will not propagate downstream to fish habitat due to channel stability afforded from geology, wood debris, or existing vegetation (i.e., alder and willow). Upon Tompkins Creek, access to the mainstem is limited and substrate armors the bank from livestock damage. The exception is the 46N64 bridge due to removal of alder during 2014 fire suppression activities. Until the alder recovers to its pre-fire condition, livestock may be more likely to cross the creek directly, instead of utilizing the bridge, when being herded. However, the effect to the streambanks will be localized and limited to when animals are being actively moved/herded.

Disturbance History/Regime - Grazing will have no effect to existing disturbance indices as reflected in by CWE modeling. All ERA models are below the critical "1" threshold; and while multiple watersheds have a USLE or GEO baseline over the threshold, grazing will not cause additional impact.

Peak/Base Flows - There will be no change in base or peak stream flow at any scale because ERA models will remain below critical threshold.

Cumulative Effects

There is potential for cumulative effects to occur from future foreseeable Federal actions. No foreseeable non-Federal (i.e., private or State) actions are known.

Actions proposed by Westside Fire Recovery potentially overlap with Lake Mountain and Middle Tompkins Allotment Management Plan. The primary interaction between effects from the two projects is (1) expansion of transient range beyond that expected to occur naturally post-fire and (2) encouragement of livestock to move to areas of the allotments not utilized in the past by following new forage opportunities along temporary roads. Westside Fire Recovery units are generally mid- to upper-slope, avoiding most aquatic emphasis areas; and although salvage harvest will not occur within any hydrologic Riparian Reserve, other project elements, such as site preparation and hazardous fuels treatment, will happen to some extent.The most likely scenario for interaction is for livestock to spread out upon the landscape to take advantage of transient range, with animals returning to patterns similar to pre-fire as transient range opportunities decrease. Where temporary roads access Westside Fire Recovery units, these routes will not lead cattle to sensitive fish-occupied locales, such as mainstem Tompkins Creek. There is some uncertainty of how livestock will respond to Westside Fire Recovery treatments so the cumulative impact to aquatics cannot be definitively stated, but it will likely be insignificant to undetectable.

Alternative 3 – Current Management

Direct Effects and Indirect Effects

Under Alternative 3, livestock management as currently implemented would continue. Livestock utilization at its present level would occur upon Lake Mountain Allotment; and livestock would not be authorized for Middle Tompkins Allotment. Neither the redevelopment of Lookout Spring nor Faulkstein Camp Meadow exclosure construction would occur.

There would be no direct effects to fish or fish habitat.

Lake Mountain Allotment

Indirect effects as examined under Alternative 2 would continue at their present level <u>for Lake Mountain Allotment only</u>. Of the Indicators discussed, only “Chemical/Nutrients” apply for this alternative to this allotment and have the potential to affect fish habitat. In review, there may be insignificant effects by this Indicator to aquatic emphasis areas above fish habitat, but effects within fish occupied reaches will not be meaningfully detected.

Middle Tompkins Allotment

Middle Tompkins Allotment has not been grazed since 2007, and, therefore, the non-authorization of livestock would not alter the existing condition. Consequently, this Alternative will not result in any indirect effects to this allotment, beneficial or adverse. All Indicators discussed under Alternative 2 would retain their current status.

Cumulative Effects

There is potential for cumulative adverse impacts to fisheries resources from Alternative 3 for Lake Mountain Allotment only.

Lake Mountain Allotment

Alternative 3 would continue current management practices upon the Lake Mountain Allotment. Because current management is similar to Alternative 2 in respect to aquatic resource impacts, the cumulative effects discussion presented is also valid. In summary, there is some uncertainty of how livestock will respond to Westside Fire Recovery treatments, so cumulative impact to anadromous salmonids, Forest Service Sensitive species, and Management Indicator Species cannot be definitively stated, but will likely be insignificant to undetectable.

Middle Tompkins Allotment

Middle Tompkins Allotment has not been grazed since 2007. Continuation of current management under Alternative 3 would maintain the vacant condition of the allotment. Consequently, this Alternative will not result in any indirect effects, unlike the Lake Mountain Allotment. Without direct or indirect effects within the footprint of future foreseeable actions, there cannot be cumulative effects.

Summary of Effects

Of the elements comprising the Project, only livestock grazing has the potential to affect aquatic resources. There will be no direct effects. Potential indirect effects are either insignificant or will not be meaningfully detected within fish-occupied stream reaches. The effect of Alternative 1 (No Grazing) will be insignificantly positive. Alternative 2 (Proposed Action) and Alternative 3 (Current Management) both have insignificant negative effects, with the latter less so because impacts will be restricted to Lake Mountain Allotment. Insignificant to undetectable adverse cumulative effects may occur for both Alternative 2 and Alternative 3 due to the interaction of Westside Fire Recovery with the Project.

Therefore, the Fish Biologist has reached the following determination:

Species	Special Status	[1,2]Determination (Alt 1)	[2]Determination (Alt 2, Alt 3)
Fishes			
Coho Salmon (and CH)	Federally Threatened	NLAA	NLAA
Chinook Salmon (Spring/Fall runs) (Upper Klamath-Trinity Rivers)	FSS	MANL	MANL
Steelhead Trout (Klamath Mountains Province)	FSS, MIS	MANL	MANL
Rainbow Trout	MIS	MANL	MANL
Pacific Lamprey	FSS	MANL	MANL
Klamath River Lamprey	FSS	MANL	MANL
Other Habitat			
Essential Fish Habitat (Coho/Chinook)		No effect	May adversely affect

[1]All Determination effects for Alternative 1 are <u>neutral</u> or <u>positive</u>.

[2]<u>Federally Listed Species</u>
NA - Will not affect the species or its Critical Habitat
NLAA - May affect, not likely to adversely affect the species or its Critical Habitat
LAA - May affect, likely to adversely affect the species or its Critical Habitat
<u>Forest Sensitive Species (FSS) / Management Indicator Species (MIS)</u>
NE - No effect to the species (FSS and MIS)
MANL - May affect individuals, but is not likely to lead to a trend towards listing (FSS); and/or
May affect individuals, but is not likely to lead to a decreasing population trend (MIS)
MALT - May affect individuals, and is likely to result in a trend towards listing (FSS); and/or
May affect individuals, and is likely to lead to a decreasing population trend (MIS)

Comparison of effects of alternatives for analysis Indicators.

Indicator	Alternative 1	Alternative 2	Alternative 3
Temperature	0	-/-	-/-
Turbidity	0	-/0	0
Chemical/Nutrients	+/+	-/-	-/- (less than Alt 2)
Substrate	0	-/0	0
Streambank Cond.	0	-/-	0
Dist. History/Regime	+/+	-/-	0
Peak/Base Flows	0	0	0

0 = Neutral effects
- = Insignificant or discountable negative effects
+ = Insignificant or discountable positive effects
S-= Significant negative effects
S+ = Significant positive effects
/ = Short-term/long-term effects

Compliance with law, regulation, policy, and the Forest Plan

All Alternatives will meet Forest Plan Standards and Guides, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, Northwest Forest Plan, and all other relevant regulations, laws, and policies. Section 7 consultation will be completed with the National Marine Fisheries Service for Alternative 2 (Proposed Action).

Aquatics Resource Report

Introduction

The purpose of this report is to discuss the effects of the Lake Mountain and Middle Tompkins Allotment Management Plan Project on aquatic Threatened, Endangered and Candidate species listed for protection under the Endangered Species Act. Threatened, Endangered, and Candidate species proposed for listing are designated by the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) under authority of the Endangered Species Act (Act) of 1973, as amended. The Act requires federal agencies insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of those species habitat. Additionally, Essential Fish Habitat (EFH) consultation occurs under of the Magnuson-Stevens Fishery Conservation and Management Act.

This report will also discuss the effect of the project on aquatic Forest Service Sensitive and Management Indicator Species. Federal laws and direction applicable to Sensitive species include the National Forest Management Act (NFMA, 2000) and Forest Service Manual (USDA, Forest Service, 1995, FSM 2670). Sensitive species are classified at the Region level, and management indicator species by the Forest. The Klamath Land and Resource Management Plan (LRMP) directs the Forest to (1) “maintain or improve habitat for aquatic species, especially TE&S” and (2) “maintain suitable fish habitat that will support well distributed, viable populations of native and desirable non-native fish”. To this end, the Forest has adopted an aquatic conservation strategy, including the designation of buffered Riparian Reserves and Standards and Guidelines to maintain habitat for aquatic species (USFS 1995).

Proposed Actions and Alternatives Analyzed

The Klamath National Forest proposes to continue to permit livestock grazing on two allotments on the Oak Knoll and Scott River Ranger Districts. These allotments are Lake Mountain and Middle Tompkins. For the purpose of analysis and discussion, the proposed action is divided into smaller elements to as to better address the potential effects on fish and their habitat. These project elements include:

- Adaptive management process
- Allotment boundary adjustments
- Livestock transportation to and from the allotments
- Livestock grazing within the allotments
- Allotment monitoring
- Proposed exclosures at Lookout Spring and Faulkstein Camp Meadow, as well as additional structures which have been pre-identified as options under the adaptive management process

For a detailed description of all Alternatives, see Chapter 2 of the Environmental Assessment.

Methodology

A list of Threatened, Endangered, and Candidate species was obtained online from the Arcata FWS office website on April 18, 2014 (FWS 2014). Species considered as Forest Service Sensitive were compiled by the Forest Service Pacific Southwest Regional Office (most recent update in 2013). These lists were used as a basis for determining which aquatic species were to be considered in this specialist report. See **Table 1** for a summary. Terrestrial and semi-aquatic species, including amphibians, are analyzed in the Wildlife report.

The only Threatened or Endangered fish in the analysis area is the Southern Oregon/Northern California Coasts Coho salmon (*Oncorhynchus kisutch*), including Critical Habitat. Sensitive fish species for the Klamath National Forest in the Project are the Upper Klamath-Trinity Rivers Chinook (*Oncorhynchus tshawytscha*), Klamath Mountains Province Steelhead (*Oncorhynchus mykiss*), Klamath River lamprey (*Entosphenus similis*), and Pacific lamprey (*Entosphenus tridentatus*) Both steelhead and resident rainbow trout (*Oncorhynchus mykiss*) are management indicator species in the Forest Plan. Additionally, Essential Fish Habitat designation is associated with Coho salmon and Chinook salmon. See **Table 1** for a summary of aquatic Project species. Since analyzed species have overlapping needs and habitat, the same Indicators are used to indicate effects to all analysis species. These Indicators are outlined in the following section.

Table 1. Summary of analysis species, including status of each.

Species		**Endangered**	**Threatened**	**Forest Sensitive**	**MIS**	**Critical Habitat**	**Essential Fish Habitat**
Salmonids							
Coho Salmon (Southern Oregon/Northern California Coasts)	*Oncorhynchus kisutch*		X			X	X
Chinook Salmon (Spring/Fall runs) (Upper Klamath-Trinity Rivers)	*Oncorhynchus tshawytscha*			X			X
Steelhead Trout (Klamath Mountains Province)	*Oncorhynchus mykiss*			X	X		
Rainbow Trout	*Oncorhynchus mykiss*				X		
Lamprey							
Pacific Lamprey	*Entosphenus tridentatus*			X			
Klamath River Lamprey	*Entosphenus similis*			X			

The Project area was visited multiple times by Maija Meneks (Fish Biologist – USFS) to examine potentially affected aquatic resources. Dates including October 16th, December 5th, 2012; January 31st, February 14th, February 25th, July 8th-10th, 2013; and April 28th, May 1st, October 3rd, October 22nd, October 29th, 2014.

Data sources used to determine historic/current anadromous and resident salmonid distribution and habitat condition included:

1. Forest GIS layers
2. CalFish on-line database
3. Habitat/fish presence surveys performed by Forest Service personnel or contractors

This information, as well as scientific literature, field review, Project watershed and geology reports, and best professional judgment, was the basis for evaluating impacts to aquatic resources in the Project area.

Information specific to the biological requirements of species under consideration in this document is found in **Appendix B**.

Analysis Indicators

The analysis of the potential effects to fish and their habitat is organized by direct and indirect effects and by effects to seventeen Indicators of anadromous fish habitat conditions (**Table 8**). The Indicators originate from the "Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area" (USDI, USDA, and NOAA 2004). Further discussion of Indicators is found in **Appendix C**. Effects of project elements to an Indicator may be neutral (no effect), discountable (extremely unlikely to occur), insignificant (effects are not able to be meaningfully measured, detected, or evaluated), or significant (effects able to be measured). Furthermore, effects may be either positive or negative. After the appropriate Indicators have been evaluated, the resulting information is used to determine overall effects on aquatic species, including Coho Critical Habitat and Essential Fish Habitat.

Although the methodology for effects analysis only technically applies to anadromous fish within the Project area (e.g., Coho, Chinook, and steelhead), it may also be used for resident rainbow trout to ensure a consistent assessment of fish species; and indirect effects to anadromous fish will serve as a proxy for lamprey. Additionally, Indicators are used to assess the existing environment of anadromous systems, with each Indicator labeled as to if it is "Properly Functioning," "Functioning-At-Risk," or "Not Properly Functioning" for a given stream (**Appendix C, D**).

Focus for analysis will be upon **aquatic emphasis areas** (**Table 4**). Aquatic emphasis areas are meadows and other locations that receive medium or high levels of grazing and contain stream channels that are accessible to cattle. Therefore, these are the locations where potential aquatic impacts from the Project are expected to originate. Most streams of the action area are, in practice, inaccessible to cattle due to steep topography and difficult footing. There are few wet meadows, and many of these areas do not have defined stream channels, only high water tables. Therefore, cattle primarily access streams in low-gradient wet meadows such as the headwaters of Fish Creek, Rancheria Creek, and Tyler Meadows Creek. Aquatic emphasis areas, and how they were identified, are discussed in the "Affected Environment" section.

Spatial and Temporal Bounding of Analysis Area

The analysis area for aquatic resources includes effects at the site-specific and watershed-scale extent, with a focus upon aquatic emphasis areas.

Watersheds utilized in the analysis are at the 5th- and 7th-field level.

Site scale effects to aquatic resources are not expected because no aquatic emphasis areas occur within or immediately adjacent to fish habitat. Furthermore, there will be no exposure of vulnerable life stages – eggs and nonmobile hatchlings – to trampling. Indirect effects associated with grazing within aquatic emphasis areas, as well as upon the general landscape, may occur as at the 7th and/or 5th field watersheds scale.

Temporal analysis timeframe includes effects during implementation, short-term effects expected to occur within the first year following implementation, and long-term effects (greater than one year).

Analysis Indicators and Locations Excluded From Further Analysis

The following Project elements as listed in the "Proposed Action and Alternatives Analyzed" section will not affect fish or fish habitat, and therefore will not be further discussed:

- **Adaptive Management Strategy** – Administration of permits utilizing an adaptive management strategy has no direct mechanism to affect fish or fish habitat. The Project element for livestock grazing will cover potential Project effects including the influence of adaptive management strategies.
- **Allotment Boundary Adjustment** – Adjustment of allotment boundaries will not affect fish or fish habitat because this action is an administrative exercise being taken to reflect actual animal distribution and forage utilization. Neither physical benefit nor impairment will result from this change. Terrain, lack of water and/or forage, and other factors already prevent animals from accessing those portions of allotments proposed to be excluded from the boundary. Conversely, the adjustment which increases Middle Tompkins Allotment in size will not open new areas to grazing because these areas were utilized prior to the 1995 boundary digitization, and have been included within permits subsequent to that year. The Project element for livestock grazing will cover the potential effects of cattle use within the proposed boundaries.
- **Livestock Transportation** – Livestock is hauled to turnout location (Lake Mountain Allotment) or corral (Middle Tompkins Allotment) by vehicle. Due to the relatively small number of animals permitted, standard cattle/horse trailers are utilized, not commercial hauling rigs. Animals gathered at the end of the season are transported from the allotments by the same equipment. Because cattle are moved into the allotments by vehicle, they do not have the opportunity to wander and access water and forage along their path as might occur if they were being herded to pasture from an off-Forest location. Therefore, impact of livestock transportation is no more than would be expected given general vehicle use upon the KNF road system. Active herding of livestock within allotments, including between pastures and end-of-season gathering, is addressed under the Project element for livestock grazing.
- **Monitoring** – Monitoring techniques involve minimally invasive, non-mechanized instream work that is outside of fish habitat and will not result in any downstream effects to fish.
- **Lookout Spring Redevelopment** – Redevelopment of Lookout Spring will involve a minimal degree of non-mechanized ground disturbance at a hillside spring distant from fish or fish habitat (over 2.2 miles). There is no surface connection of the spring to Kuntz Creek as water soaks into hillside soils with no scoured channel present. Some water

from the spring will be diverted into a trough for livestock use outside the proposed exclosure fence; and water which overflows the trough will return back to the spring system.

- **Faulkstein Camp Meadow Headcut Exclosure** – The headcut exclosure at Faulkstein Camp Meadow will be of a fence type which does not require ground disturbance. Distance from fish or fish habitat is about 1.7 miles.

Other adaptive management structure options are not known at this time, and therefore cannot be analyzed. If additional structures are proposed, they will be evaluated upon need to consult based upon proposed action and location upon the landscape in regards to fish and fish habitat.

The following Indicators are to be excluded from analysis because Project components will not affect anadromous/resident fish or their habitat:

Physical Barriers –There are human-made barriers upon several streams within or influenced by the Project area. Removal or modification of these barriers for fish passage is outside the scope of this Project. No new barriers will be built as a consequence of this Project.

Large Woody Debris – Within streams of the project area, generally conifers provide most of the habitat-forming large woody debris in fish-bearing reaches. Cattle will browse on leaders and leaves of woody brush (e.g., willow) and young hardwood trees species (e.g., alder, aspen, cottonwood). Cattle do not eat conifers; and livestock have been used in the Project area in the past to promote tree growth within plantations by suppressing competition from grasses, herbs, and brush (USFS 2014b). Cattle grazing along meadow streams reduces grass and shrubs but it does not impact existing large woody debris in/near channels, nor recruitment thereof.

Pool Frequency and Quality – The proposed grazing may cause only minor changes to the soil regime at the site level (see “Turbidity” and “Substrate” indicator effects discussion). Because of the limited extent and intensity of proposed grazing, sediment impacts are likely at only a few sites and would not be detectable at the watershed scale (as described in the Hydrology report [USFS 2014a]). There is low probability that the Project could cause channel-altering events with the power to move downstream and impact channel morphology in fish habitat. Furthermore, grazing would not affect large woody debris, which can be an important component in regards to pool formation in montane systems (Buffington, *et al*. 2002). For these reasons, the project would not impact the frequency and quality of pools in fish habitat downstream from aquatic emphasis areas (1.9 miles from Coho Critical Habitat, 1.1 miles from anadromy, and 0.4 miles from resident rainbow trout).

Off-Channel Habitat – There is no overlap of fish occupation or habitat with aquatic emphasis areas.

Off-channel habitat is generally not a significant component in narrow mountainous channel types (Rosgen A and B) with limited floodplain development, such as those present in much of the Project area. However, some off-channel habitat is present in lower Tompkins Creek within the areas occupied by fish. As discussed throughout this document, cattle are not attracted to mainstem Tompkins Creek due to lack of forage, rocky banks creating conditions of poor footing, and topography. Because livestock are not expected to be present, there will be no effect to off-channel habitat.

Refugia – Refugia is a synthesis of presence and degree of functionality of habitat elements for fish throughout their life history. Consideration may include stream temperature, water quality, riparian reserve, water flow, sediment in pools, and connectivity. As there will be no change in the ability of riparian or instream habitat components to maintain present fish populations, and nor will connectivity between local and distal populations be altered, there will be no effect to this Indicator.

Width/Depth Ratio – The proposed grazing may cause only minor changes to the soil regime at the site level (see "Turbidity" and "Substrate" indicator discussion discussion). Because of the limited extent and intensity of proposed grazing, sediment impacts are likely at only a few sites and would not be detectable at the watershed scale (as described in the Hydrology report [USFS 2014a]). There is low probability that the Project could cause channel-altering events with the power to move downstream and impact channel morphology in fish habitat. For these reasons, the project would not impact channel width to depth ratios in fish habitat downstream from aquatic emphasis areas (1.9 miles from Coho Critical Habitat, 1.1 miles from anadromy, and 0.4 miles from resident rainbow trout).

Floodplain Connectivity – Floodplains are generally not a significant component in mountainous channel types (Rosgen A and B) such as those present in fish-bearing reaches of the Project area. At only a few sites floodplains may be affected by grazing; as described in the Hydrology Report, less than 1% of all Riparian Reserves are within areas that receive concentrated/high use (and all areas receive at least 6 months rest annually). These areas are all above fish habitat (1.9 miles from Coho Critical Habitat, 1.1 miles from anadromy, and 0.4 miles from resident rainbow trout). As peak/base flows will maintain proper functioning, flow access to upper banks and side channels will continue to occur in a manner unchanged from current conditions.

Drainage Network – The drainage network can be roughly considered in light of road density, number of road crossings, and overall ERA, but primarily it is an aspect of how "connected" a drainage feature (road, ditch, or other feature) is to the natural hydrologic system.

Due to the steepness of the terrain and natural livestock behavior, cattle utilize roads and existing trails to move between forage areas within allotments. In the Project area, cattle use roads and roadbeds abandoned from past timber extraction or other management use. Because of the extended history of cattle use in the area, trails have long been established, and have been evaluated to be in stable condition. Most trails are associated with ridges, upper slopes, and fishless headwater areas because this is the location of all concentrated use sites and the majority of capable lands. Therefore, as livestock are expected to continue to use the current road and trail system at levels that are either less than or do not exceed recent use, there will be no change to the drainage network.

Road Density/Location – No roads will be constructed nor removed as a result of this Project and therefore this indicator will not be affected.

Riparian Reserves – Project grazing does not occur in Riparian Reserves associated with CH. The only location where cattle have the potential to enter Riparian Reserve associated with CH is along mainstem Tompkins Creek.

Herbaceous vegetation attractive to livestock is relatively sparse along the Tompkins Creek mainstem due to shading by trees and brush. Overstory vegetation primarily consists of conifers and large alder. Many of the alders present along the streambanks appear to be similar in age and were likely established following the scouring flows of the 1964 flood event. Because forage is not readily available and access to water is difficult due to rocky streambanks and topographical factors like steep slopes, cattle are not expected to be drawn to nor linger within this area. Furthermore, when livestock are being herded across Tompkins Creek at the Forest Road 46N64 crossing, animals will not be allowed to stop for either water or forage. Incidental use by cattle will have no measurable effect on the functionality or condition of the Riparian Reserve within Coho CH.

Overall, the impact to riparian vegetation along the Tompkins Creek mainstem due to the 2014 Happy Camp Complex was minimal, and in places there was little to no effect to trees or brush adjacent the creek (**Photo 1a, b**). With the exception of scattered individual tree mortality, streamside overstory alder and conifer remain intact post-fire. Where low burn severity did impact understory vegetation, recovery to conditions similar to pre-fire is expected to be swift (1 or 2 growing seasons), with vine maple, blackberry, and other fast-growing vegetation the species primarily affected (M. Meneks, pers. obs.).

Photo 1a. Burned understory vine maple. Basil resprout is present.

Photo 1b. Unburned location along Tompkins Creek.

Project grazing primarily occurs within aquatic emphasis areas, the closest of which is about 2 miles from CH. The only mechanism by which the Project could affect downstream Riparian Reserves is if it caused, or increased the likelihood of, channel altering events like debris flows or large and/or chronic sediment inputs. As reviewed under various relevant Indicator discussions (e.g., Substrate, Disturbance Regime and History, Streambank Condition), there is low probability that such will occur.

In summary, there will be no effect to the functionality or condition of Riparian Reserve within Project area for fish or fish habitat as a result of grazing.

The following 7th-field watersheds which <u>do not</u> contain aquatic emphasis areas will not be carried further in the analysis:

- <u>Deep Creek</u> – The Deep Creek 7th-field watershed is a "compound watershed", meaning it incorporates multiple unconnected drainages to the east and west side of Scott River in its boundary. Within the Project area, Deep Creek is the principle stream, and it has been

assessed as fishless. The Deep Creek subdrainage itself will be excluded from the proposed Middle Tompkins boundary (see **Map 2**). The remnant hillslope portion of the HUC which remains within the allotment supports minimal non-riparian capable forage areas.
    - Although Scott River is part of this 7th-field watershed, it will be considered separately on the 5th-field scale.
- O'Neil Creek – O'Neil Creek, the principle stream of this watershed, supports Coho, Chinook, steelhead, and rainbow trout. Because a barrier prevents upstream access by spawning adults, the first two species primarily utilize the lowermost portion of O'Neil Creek as rearing and thermal refugia of juveniles produced elsewhere in the Klamath system. In addition to not supporting aquatic emphasis areas, much of this watershed will be excluded from the proposed Lake Mountain boundary; and capable areas in the headwaters minimally overlap within riparian areas (see **Map 1**).
- Schuttz Gulch-Klamath River – In addition to not supporting aquatic emphasis areas, this compound watershed will be excluded from the proposed Lake Mountain boundary (see **Map 1**).
- Tom Martin-Klamath River (partial) – The subdrainages of Macks Creek, Mill Creek, and Mitchell Creek support resident rainbow trout, but do not have aquatic emphasis areas.

The following 7th-field watersheds with aquatic emphasis areas, but which have no fish resources, and thus no chance for exposure, are not carried further in the analysis:

- McCarthy Creek-Scott River – Within the Project boundary, McCarthy Creek is the primary drainage of this compound watershed, which is approximately 2.4 miles upstream of fish habitat in the Scott River. One aquatic emphasis area is present – McCarthy Meadow Complex. No fish are present in McCarthy Creek (see **Map 2**).
    - Although Scott River is part of this 7th-field watershed, it will be considered separately on the 5th-field scale.

Summary of Analysis Indicators and Locations Retained for Analysis

The following Project elements have the potential to affect fish or fish habitat, and therefore will be included in the subsequent analysis:

- Livestock grazing within allotments (focus on effects from aquatic emphasis areas)
    - This Project element includes active herding of animals within an allotment, such as between pastures and end-of-season gathering.

The following Indicators are potentially affected by Project elements, and therefore will be included in the subsequent analysis:

- Temperature
- Turbidity
- Chemical Contamination/Nutrients
- Sediment/Substrate
- Streambank Condition
- Disturbance History and Regime
- Peak/Base Flows

Based on consideration of proximity of fish and their habitat, along with the probability of direct and indirect effects, the area where there is potential for exposure of fish to Project activities within the analysis area (and therefore subject to effects analysis) is:

Site Scale
The distance between Project elements and fish and their habitat is described in **Table 3**. No aquatic emphasis areas occur within or immediately adjacent to resident or anadromous fish habitat. Elsewhere in the allotments, livestock forage areas occur adjacent to streams outside of fish habitat. Where cattle use potentially overlaps fish habitat, including Coho Critical Habitat, is along Tompkins Creek. However, lack of forage, rocky bankside terrain, and topography severely restricts desirability and access for livestock; and when animals are being active herded, they will not be allowed to water, forage, or otherwise linger when crossing Tompkins Creek via a bridge. Therefore, there are no site scale effects within fish habitat. Indirect effects from proposed Project elements may occur in 7th and/or 5th field watersheds and are described next.

7th-Field Watershed Scale
Middle Creek – Middle Creek
Middle Creek is the principle stream of this 7th-field watershed within the Project area. Resident rainbow trout are found in Middle Creek. One aquatic emphasis areas is present – Middle Meadow.

Rancheria Creek – Rancheria Creek
Rancheria Creek is the principle stream of this 7th-field watershed within the Project area. Steelhead and rainbow trout are found in Rancheria Creek. Two aquatic emphasis areas are present – Maple Spring Complex and Rancheria Spring Complex.

Tom Martin-Klamath River (partial) – Kuntz Creek
Kuntz Creek is the principle stream of this 7th-field watershed which has not been previously excluded from analysis. Resident rainbow trout are found in Kuntz Creek. One aquatic emphasis area is present – Kuntz Meadow.

Tompkins Creek – Tompkins Creek
Tompkins Creek is the principle stream of this 7th-field watershed within the Project area. Coho, steelhead, and rainbow trout are found in Tompkins Creek. One aquatic emphasis area is present – Tompkins Meadow Complex.

Upper Grider Creek – Grider Creek, Fish Creek, Tyler Meadows Creek
Grider Creek is the principle stream of this 7th-field watershed, although only the Fish Creek and Tyler Meadows Creek tributaries are actually within the Project area. Coho, steelhead, and rainbow trout are found within portion of Grider Creek contained by this watershed area. Two aquatic emphasis areas are present – Faulkstein Camp Meadow and Tyler Meadows.

5th-Field Watershed Scale
Lower Scott River – Scott River; Seiad Creek-Klamath River – Grider Creek, Klamath River
All fish species of interest – Coho, Chinook, steelhead, rainbow trout, lamprey – are present in Grider Creek, Klamath River, and Scott River. This scale considers impacts on a large landscape

scale, as well as potential distal effects to mainstem systems originating from streams excluded on the 7th-field scale, such as Macks Creek and McCarthy Creek.

Temperature

This Indicator is rated by stream temperature, and the expected increase/decrease from the existing condition due to Project activities (**Appendix C, D**).

Turbidity and Sediment/Substrate

The turbidity and substrate Indicators are discussed together due of their close relationship.

- Turbidity: This Indicator is rated by professional judgment following observation of conditions after high water events, amount of substrate fines, CWE models (USLE/GEO), and condition of Riparian Reserves (**Appendix C, D**).
- Sediment/Substrate: This Indicator is rated by percentage of substrate composition of finer material. Considered data can include composition of surface and subsurface of non-pool units, as well as volume of pools filled with fines. Where no or limited survey data is available, evaluation may utilize CWE (USLE/GEO) models and professional judgment (**Appendix C, D**).

Turbidity describes suspended sediment in the water column. It is generally composed of very small particles like silts, because larger material is difficult to keep suspended except at high flows (Swanston 1991). Because a degree of turbidity is natural in stream systems, often observed during spring run-off and storm events, fish are adapted to it (Bjornn and Reiser 1991).

Sediment in streams is a part of the natural geological process; and certain erosive geologies, such as granitic soils, can impart a high amount of fines to a stream system even from Wilderness locales. It is when management activities upon the landscape increase incoming sediment flux within a drainage such that it is higher than normal background processes that human-induced impact to aquatic resources begin to occur. Depending upon the scale considered, effects may be highly localized (i.e., at the confluence of two streams) or more diffuse (i.e., multiple miles of increased spawning bed embeddedness).

Parsons, *et al*. (2006a) summarizes the relationship of erosion, starting with the concept that most sediment transported by streams is delivered from the bed and banks of channels and alluvial deposits within the catchment. Therefore, except where a landslide intersects a live stream channel or other similar unusual circumstances, sediment must travel overland before it can contribute to the stream substrate environment. Movement of fine sediment, both overland *and* instream, is dependent upon factors such as slope gradient and length, roughness, and precipitation/water; and even under ideal modeled or experimental circumstances, most sediment does not move very far from its source. For instance, Parsons, *et al.* (2006b) performed a series of controlled experiments, finding maximum sediment yield 7 m from a source; and this distance is consistent with other models, experiments, and observations (Parsons, *et al*. 2006a). Beyond this point, sediment yield quickly declines.

Due to the rocky nature of channels and streambanks throughout much of the Project area, aquatic emphasis areas are the primary sites where bare banks may occur as a result of livestock grazing. This is because bank composition in meadows tends to be fine-grained soils which are at higher risk to disturbance from hoof sheer, especially if the vegetation root mass is compromised. The mobilization of fine sediment from small extents of raw or poorly vegetated streambanks is not well studied. Outside the laboratory environment, chronic and elevated levels of turbidity considered detrimental to aquatic organisms only occur following catastrophic natural incidents such as large landslides or extensive wildfires, or where human activities exacerbate sediment mobilization from extensive raw surface available for continuous stream erosion (Meehan 1991; Neary, *et al*. 2008). Additionally, distance turbidity can be observed from its source in the case of limited exposure is not well studied, but appears to be spatially limited. For instance, a study commissioned by the Environmental Protection Agency found that turbidity caused by instream suction dredging returned to acceptable water quality levels within 250 feet (Royer, *et al*. 1999). Furthermore, the KNF programmatic Facilities Maintenance and Watershed Restoration Biological Assessment included consultation upon minor instream activities such as culvert replacement, determining that turbidity was undetectable beyond a distance of 300 feet (USFS 2004).

Chemical Contamination/Nutrients

This Indicator is rated by potential for nutrient contamination, and the expected change from the existing condition due to Project activities (**Appendix C, D**). Due to a lack of a specific category, fish pathogens will also be discussed.

Within the Klamath River system, *Ceratomysa shasta* (*C. shasta*), *Ichthyophthirius multifiliis* (Ich), and *Flavobacterium columnare* (Columnaris) are the primary mortality-inducing pathogens which affect salmonid health. *C. shasta* causes mortality in juvenile fish, while Ich and Columnaris generally attack adults returning from the ocean to spawn, although other lifestages can be infected.

Neither Ich nor Columnaris will be further discussed in relation to this Project. While both pathogens are widespread in the Klamath River basin, and undoubtedly are responsible for individual deaths, large fish-kill events, such as that observed in 2002, are related to factors not influenced by grazing. Specifically, the 2002 mass mortality appears to have been linked to low river flows downstream of Iron Gate Dam causing upstream migration delays, with temperature a possible contributive factor by increasing the stress of holding fish, as well as creating better conditions for pathogen growth (Belchik, *et al*. 2004).

The pathogen *C. shasta* has very complex lifecycle. As discussed by Stocking (2006) and Stocking and Bartholomew (2004), *C. shasta* will affect a number of fish species, including salmonids, but for one leg of its lifecycle it has an obligate intermediate host – the polychaete worm *Manayunkia speciosa*. Habitat for *M. speciosa* is primarily in organic matter and fine bottom sands, although it will also infest *Cladophora*, an algal species that thrives in nutrient-enriched waters such as the Klamath River mainstem, so much so that it will form extensive mats. It is believed that habitat alteration by Iron Gate Dam, including elevation of fine sediment and creation of general conditions encouraging *Cladophora* growth, has promoted *M. speciosa* populations. With an increase in intermediate host availability, prevalence of *C. shasta* has also increased compared to elsewhere in the watershed. Although Iron Gate Dam, as well as basin-wide impacts from agriculture, has the greatest impact to river health as it relates to fish infection by *C. shasta*, there is the slim potential within Project allotments for grazing to contribute to the detrimental environmental conditions.

Streambank Condition

This Indicator is rated by percent stability of the streambank. Where no streambank stability data is available, evaluation is a synthesis of density of road stream crossings, amount of inner gorge road, amount of clearing/compaction adjacent to the stream, presence/extent of berms constraining the channel, and visual impact from most recent channel altering event (**Appendix C, D**).

Disturbance History and Regime

This Indicator is primarily rated using CWE (ERA/USLE/GEO) models. If professional judgment concludes that these models are not fully capturing disturbance risk, road density and location, current impacts from past stand-replacing timber harvest and wildfire, fire regime, vegetation regime, and development on private property may also be considered (**Appendix C, D**).

The ERA, USLE, and GEO models track various aspects of human and natural impacts upon the landscape and geologic environment. ERA ("Equivalent Roaded Area") provides an accounting system for tracking disturbances that affect watershed processes, in particular changes in peak runoff flows influenced by ground disturbing activities; USLE ("Universal Soil Loss Equation") tracks surface erosion and sediment delivery in the first year following project completion; and GEO estimates sediment delivery from mass wasting (i.e., landslide events) for the first decade after project completion. A threshold of "1" generally indicates an elevated risk of impact from a given model. This is not the point at which significant effects occur, but a yellow flag indicating that additional impacts need to be considered for resource degradation. Due to its diffuse nature, grazing is generally not tracked by these models. However, this Project did need to account for grazing use upon the landscape, and, therefore, modification to model calculation did occur.

Peak/Base Flows

For watershed-level, this Indicator is rated using elements of ERA, road density, vegetation and Riparian Reserve condition, and other associated components (**Appendix C, D**). Any potential effects to flows due to a site-specific Project element are considered individually.

Affected Environment

The Lake Mountain and Middle Tompkins Allotment Management Plan Project is located largely within drainages east and south of Lake Mountain lookout; and west and southwest of the community of Scott Bar, CA. The Lake Mountain Allotment encompasses several small fish and fishless drainages to the Klamath River. Within the Middle Tompkins Allotment, Tompkins Creek and Middle Creek are the primary watersheds, although there are small headwater inclusions of streams which drain west towards Grider Creek. Project elevation is approximately 2,000 to 6,800 feet.

The Project will occur within the following 5th-field and 7th-field watersheds:

- Lower Scott River: 1801020806
  - Deep Creek-Scott River: 18010208060402
  - McCarthy Creek-Scott River: 18010208060601
  - Middle Creek: 18010208060401
  - Tompkins Creek: 18010208060403
- Seiad Creek-Klamath River: 1801020611
  - O'Neil Creek: 18010206110103
  - Rancheria Creek: 18010206110203
  - Tom Martin Creek-Klamath River: 18010206110101
  - Schuttz Gulch-Klamath River: 18010206110104
  - Upper Grider Creek: 18010206110201

Legal location of Project: T.44N., R.11W., Sections 3-10, 16-18; T.44N., R.12W. Sections 1,12,13; T.45N., R.11W., Sections 2-5, 8-11, 14-18, 19-23, 26-34; T.45N., R.12W., Section 25, 36; T.46N., R.11W. Sections 17, 20, 21, 26-29, 32-36 (Mount Diablo Meridian).

Tompkins Creek is a third-order perennial of the Scott River. Flowing south, it drains the western flanks of Tom Martin Peak, the south side of Lake Mountain Peak, and much of the east side of the ridge south of Lake Mountain Peak to the Tyler Meadows area. Except for the Scott River Lodge at the mouth, ownership within the Tompkins Creek drainage is Forest Service. While Tompkins Creek has several perennial branches, as well as large intermittent tributaries, none are named. Past and present influences within the drainage include timber harvests, roads, grazing, mining, water diversion, wildfire, and flood. Coho, steelhead, and rainbow trout are present in the creek, with the upstream limits of each species (e.g., approx. three miles upstream from the mouth for SONCC Coho salmon) restricted by gradient, discharge, stream size, and/or barriers.

Middle Creek is a second-order perennial of the Scott River. Flowing east, it drains the unnamed ridges and peaks between Tyler Meadows and the Marble Mountain Wilderness. Past and present influences within the drainage include timber harvests, roads, grazing, mining, wildfire, and flood; and there is presently a special-use authorized cabin near the mouth within the area of the historic Middle Creek mining camp. Resident rainbow trout are present. Barriers at the mouth, including steep gradient and waterfalls/cascades, prevent access by anadromous fish.

Project activities occur in the headwaters of several Grider Creek tributaries: Fish Creek, Rancheria Creek, and an unnamed stream (designated "Tyler Meadows Creek" for this document). Fish Creek and Tyler Meadows Creek are first-order perennials, and Rancheria Creek is third-order. All flow west, draining the ridgeline south of Lake Mountain Peak to the Marble Mountain Wilderness boundary. All three creeks contain resident rainbow trout; and, furthermore, steelhead are present in Rancheria Creek. While the upstream limit for rainbow trout in each stream is restricted by gradient, discharge, stream size, and/or barriers, Rancheria Creek does have a definite barrier about 0.5 miles upstream from the mouth restricting steelhead access.

Project activities occur in the extreme headwaters of several Klamath River tributaries: Kuntz Creek, Macks Creek, Mill Creek, and O'Neil. Kuntz Creek, Mill Creek, and O'Neil Creek are second-order perennials, and Macks Creek is first-order. All flow north, draining the ridgeline between Tom Martin Peak and Lake Mountain Peak. All streams contain rainbow trout. Additionally, O'Neil Creek has Coho and Chinook in the lower 300 feet below Highway 96, while Macks Creek may have steelhead below the highway. For all creeks except O'Neil Creek, the culverts crossing under Highway 96 form barriers to fish upmigrating from the Klamath River. While passage at O'Neil Creek was addressed by construction of a bridge, subsequent observations determined it likely that a flow barrier under the bridge persisted. The substrate below the bridge was sealed during the summer of 2012, and surface disconnection under the bridge no longer occurs. Coho salmon can now ascend O'Neil Creek above the bridge crossing, but suitable habitat for them is limited by quickly steepening gradient. Within streams, upstream distribution of trout is restricted by gradient, discharge stream size, and/or natural barriers.

Multiple fishless tributaries to the Scott River and Klamath River are within the Project area. They may be perennial, intermittent, or ephemeral. The named streams within allotment boundaries (current and/or proposed) include Deep Creek, Jim Creek, Louie Creek, McCarthy Creek, and Townsend Gulch. Salmonid distribution is associated with the confluence zones of these creeks with their respective rivers.

Of particular interest, many of the streams in the Project area experienced extensive scouring during the 1964 and 1997 flood events. Flood impacts were likely exacerbated due to historic mining practices, fire, timber harvest, and roading. Satellite and aerial imagery, such as that available from services like GoogleEarth, which date from the years following the 1997 event clearly show areas of channel scour, as well as evidence of earth movement originating from the road system and clear-cuts. On the ground, signs of flood impact and on-going system adjustment include areas of aggradation and downcutting, streambanks comprised of cobbles and other coarse material (i.e., lacking a developed soil covering), riparian forest in early- to mid-seral stage, and general lack of woody debris (because it was transported out of the system). Not all streams were affected equally, and some systems, or portions within a larger drainage, may have experienced little to no impact.

Composition of riparian vegetation within the Project area is very diverse, reflecting differences between locations in regard to elevation, slope aspect, soil character, timber harvest and wildfire history, and local hydrologic condition. Large-scale scouring by recent floods, especially 1964 and 1997, as referenced above, has reset the riparian to an early- to mid-seral progression in many places, with regrowth retarded due to banks being reduced to cobbles and other coarse materials. Alders, big-leaf maple, cottonwood, and willow are common deciduous species; and evergreens may include Douglas-fir, western red-cedar, and other conifers. Drier, low elevation areas also may support madrone and Ponderosa pine. Several meadows are present in headwaters drainages, the largest of which are "Faulkstein Camp Meadow", "Kuntz Meadow", Middle Meadow, and Tyler Meadows.

Width of the riparian zone is varied and heavily dependent upon persistence of water (surface and subsurface) in relation to the stream channel and microclimate conditions. In dry locations such as ephemerals and short-season intermittents, the riparian zone may extend less than five feet from the channel margin and classic riparian vegetation such as alder or willow is not continuous. The contrast between riparian and uplands is obvious/stark. On the other hand, wetter systems with a developed floodplain, such as along lower Tompkins Creek, have a much wider area where groundwater influence allows growth of species which require proximity to water. The transition of "riparian" to "upland" is much more subtle, and may be difficult to definitively delineate. A stream "riparian zone" is different from the "Riparian Reserve" of the Land Resource Management Plan, the latter of which is a standard-width derived land allocation whose purpose is to serve as a planning tool. The width of a "Riparian Reserve" is generally greater than a stream's true riparian zone, and often includes true upland vegetation within it.

As with the riparian, the uplands are varied when considered across the landscape area of the Project. Brush fields, oak savannah and oak/pine woodlands, ponderosa pine, Douglas-fir, and western red-cedar are present. Past timber harvest activities upon Forest Service land, some as recent as the 1980s, created large clear-cuts, particularly in the Tompkins Creek and Middle Creek drainages, which were subsequently replanted to monoculture conifer plantations. The exact species composition of local vegetation is dependent on elevation, aspect, soils (both natural and as affected by historic mining practices), timber harvest, fire, and microclimate.

Appendix B includes specifics in regards to biology of analysis species, as well as survey records. In summary (**Maps 1, 2, 3, 4**; **Tables 2 and 3**):

Table 2. Summary of actual and potential occupancy by analysis species of creeks/rivers within 7^{th}- and 5^{th}-field watersheds.

Species	7th-Field													5th-Field	
	Klamath River	Scott River	Grider Creek	Fish Creek	Kuntz Creek	Macks Creek	Middle Creek	Mill Creek	Mitchell Creek	O'Neil Creek	Rancheria Creek	Tompkins Creek	Tyler Meadow Creek	Lower Scott River	Seiad Creek-Klamath R
Coho	X	X	X							X		X		X	X
Chinook	X	X	X							X		P		X	X
Steelhead	X	X	X			P				X	X	X		X	X
Resident Rainbow Trout	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Pacific Lamprey	X	X	X			P				P		P		X	X
Klamath River Lamprey	X	X	P			P				P		P		X	X

X - confirmed presence
P - potential presence

- Lamprey species – Confirmed presence of Pacific lamprey and Klamath River lamprey in Scott River and Klamath River, and Pacific lamprey have been reported in Grider Creek. Distribution elsewhere in the Project area is unknown. Potentially suitable habitat congruent with anadromous fish species.

Table 3. Summary of closest distance between Project activities and anadromous fish and their habitat (including Critical Habitat) – 7th- and 5th-field watersheds. Focus is on concentrated use areas. If watersheds do not have concentrated use areas, then distance to proposed allotment boundary is provided.

<table>
<tr><th>Watershed</th><th>Stream Name</th><th>Distance to Habitat occupied by Coho and CH (miles)</th><th>Distance to Habitat occupied by Steelhead Trout (miles)</th><th>Distance to Habitat occupied by Chinook (miles)</th></tr>
<tr><td colspan="5">7th-Field Watershed(s)</td></tr>
<tr><td>Deep Creek-Scott River</td><td>No fish-bearing streams</td><td colspan="3">Closest treatment same for all species [to Scott River]
Boundary - >300' (adjacent to County Rd 7F01)
(No concentrated use areas in this watershed)</td></tr>
<tr><td>McCarthy Creek-Scott River</td><td>No fish-bearing streams</td><td colspan="3">Closest treatment same for all species [to Scott River]
Conc. Use - 2.4 [via McCarthy Ck and McCarthy Ck tributary]</td></tr>
<tr><td>Middle Creek</td><td>Middle Creek</td><td>N/A - no Coho present in Middle Creek</td><td>N/A - no Steelhead present in Middle Creek</td><td>N/A - no Chinook present in Middle Creek</td></tr>
<tr><td>Tompkins Creek</td><td>Tompkins Creek</td><td>Con. Use – 1.9</td><td>Con. Use – 1.2</td><td>N/A - no Chinook present in Tompkins Creek</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="2">O'Neil Creek</td><td rowspan="2">O'Neil Creek</td><td>Boundary - 2.6</td><td>Boundary - 1.8</td><td>Boundary - 2.6</td></tr>
<tr><td colspan="3">(No concentrated use areas in this watershed)</td></tr>
<tr><td>Rancheria Creek</td><td>Rancheria Creek</td><td>N/A - no Coho present in Rancheria Creek</td><td>Con. Use - 3.6</td><td>N/A - no Chinook present in Rancheria Creek</td></tr>
<tr><td>Tom Martin Creek-Klamath River</td><td>Kuntz Creek
Macks Creek
Mill Creek
Mitchell Creek</td><td>N/A - no Coho present in Kuntz, Macks, Mill, or Mitchell Creek</td><td>Con. Use - 2.7 [via Macks Ck]
(No Steelhead present in Kuntz, Mill, or Mitchell Creek)</td><td>N/A - no Chinook present in Kuntz, Macks, Mill, or Mitchell Creek</td></tr>
<tr><td>Schuttz Gulch-Klamath River</td><td>No fish-bearing streams</td><td colspan="3">Closest treatment same for all species [to Klamath River]
Watershed not within Proposed allotment boundary
No concentrated use areas in this watershed</td></tr>
<tr><td>Upper Grider Creek</td><td>Grider Creek
Fish Creek
Tyler Meadows Creek</td><td colspan="2">Closest treatment same for both species
Grider Creek - Conc. Use - 2.5
([via Fish Ck] Coho/Steelhead present, but entirety of stream outside allotment boundary; see 5th-Field Watershed)

N/A - no Coho/Steelhead present in Fish or Tyler Meadow Creek</td><td>N/A - no Chinook present in Fish or Tyler Meadow Creek, nor Grider Creek within the watershe7th-field boundary</td></tr>
<tr><td colspan="5">5th-Field Watershed(s)</td></tr>
<tr><td>Lower Scott River</td><td>Scott River</td><td colspan="3">Closest treatment same for all species
Conc. Use - 2.4 [via McCarthy Ck and McCarthy Ck tributary]</td></tr>
<tr><td rowspan="2">Seiad Creek-Klamath River</td><td>Grider Creek</td><td colspan="2">Closest treatment same for both species
Con. Use - 2.5 [via Fish Ck]</td><td>Con. Use - 4.0 [via Rancheria Ck]</td></tr>
<tr><td>Klamath River</td><td colspan="3">Closest treatment same for all species
Con. Use - 2.8 [via Macks Ck]</td></tr>
</table>

Existing and Recent Historical Allotment Use

This subsection is summarized from the “Rangeland Resource Report” (USFS 2014b). For additional information, refer directly to the document.

Lake Mountain – Grazing of the current allotment area has occurred since at least the 1920s. Prior to 1973, the allotment extended to the north side of the Klamath River as a spring range, but has since been abandoned. Rangeland capability has likely undergone a long-term decline to its present estimated acreage due to a decrease in timber harvest, which formerly created transient forage by opening the canopy via clearcuts, landings, and other practices. The most intensive grazing occurred around 1940 when there was a high of 400 HMs. This number displays a long-term decline to the currently permitted 76 HM (**Figure 1**). The proposed action would maintain the current amount of allowed use.

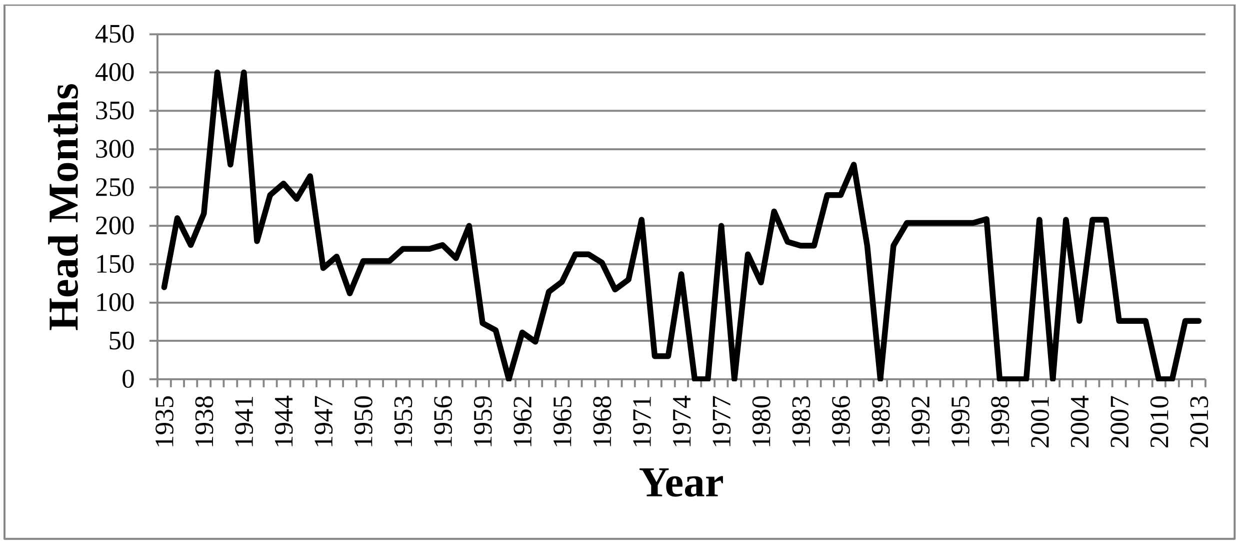

Figure 1. History of Lake Mountain Allotment permitted HMs.

Monitoring site placement and type of monitoring utilized has been adjusted over time, reflecting changes in the science of monitoring, so as to ensure better replication, track trends, and improve overall data quality/utility. Synthesis of available data suggests the long-term trend for Lake Mountain Allotment is static to upward. The allotment, including the more heavily utilized areas, is presently considered to be in satisfactory condition. A localized exception is Lookout Spring. One of the proposed action elements for the Project will improve the spring so as to address this issue. Of additional note, monitoring photo documentation and aerial photos have observed increased tree canopy over the last 50 years in the vicinity of Kuntz Creek headwater meadow, including conifer encroachment into the meadow. This is likely due to natural succession in the absence of fire and timber harvest.

Middle Tompkins – Grazing within the allotment area has occurred since at least the 1920s, although allotment configuration has been variable. In particular, the Tyler Meadows, Faulkstein Camp, and Yellowjacket Springs areas have permitted livestock under several different management plans. The proposed action allotment configuration was established in 1979. Although an apparent error in digitization in 1995 created the "current" boundary, subsequent livestock distribution and AOI documents have continued to reflect the pre-1995 condition.

Similar to Lake Mountain Allotment, overall forage capability in the Middle Tompkins Allotment has likely declined over time to its current estimated extent. However, some selective harvesting and an increase in fuels treatment projects does continue to open transient hillslope range. For much of its recent history, Middle Tompkins Allotment permitted 450 HMs. To address unfavorable range conditions and difficulty in maintaining appropriate cattle distribution, livestock numbers were reduced beginning 2004; non-use began starting in 2007; and in 2012 the permittee waived further use of the permit, returning it back to the government. Therefore, Middle Tompkins Allotment has had no grazing since 2007, and is now to be resumed by this Project. The proposed utilization level of 250 HMs would be a decrease over the long-term average (**Figure 2**).

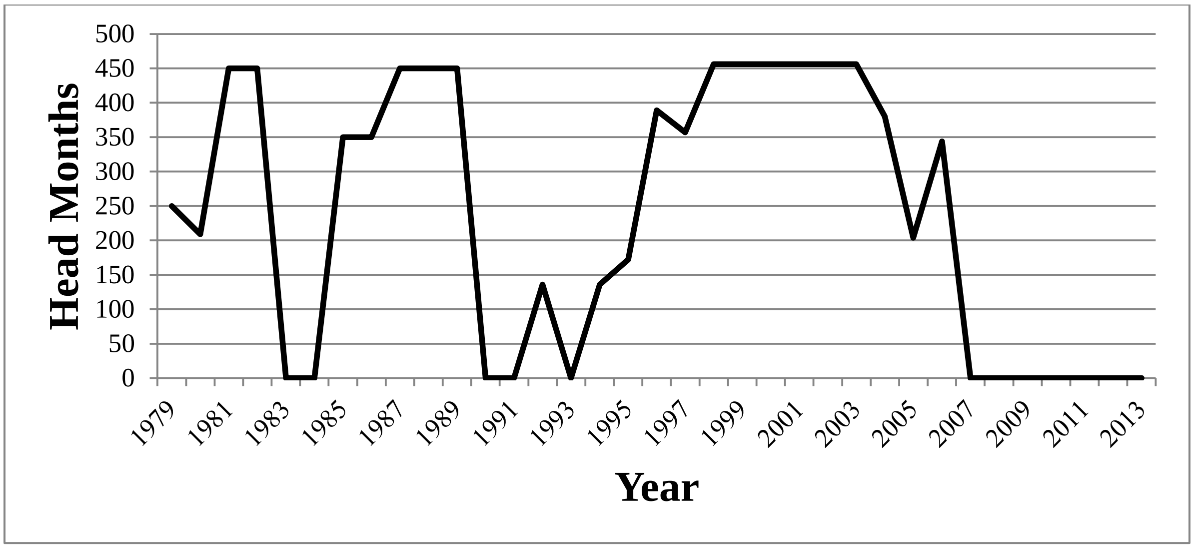

Figure 2. History of Middle Tompkins Allotment permitted HMs.

Similar to the Lake Mountain Allotment, monitoring within Middle Tompkins Allotment has altered over time. Past monitoring has suggested unsatisfactory conditions with little change in the trend, but these results were influenced by poor site placement. In preparation for resumption of grazing, monitoring sites have been re-established at more appropriate locations and evaluated using updated protocols. All sites are considered to be satisfactory, with overall trend to have been upward since cessation of use in 2007.

Following a 1997 NMFS Biological Opinion on grazing on the KNF, a monitoring strategy for Middle Tompkins Allotment was developed. Focus was placed upon Tompkins Creek as the only anadromous stream within the allotment potentially accessible by cattle. A photo point was established downslope of the holding corral. Photos taken 1998 through 2013 document recovery from the 1997 flood that scoured the creek, but no evidence of livestock was seen. Furthermore, monitoring reports submitted 1998 through 2008 specifically note that there was no grazing use along the anadromous portion of Tompkins Creek due to lack of desirable forage (USFS 2009).

Aquatic Emphasis Areas

Aquatic emphasis areas are sites where livestock concentrate grazing within an allotment, and that also contain stream channels that are accessible to cattle. Additionally, stream channels must be perennial or intermittent in nature, thus potentially connecting grazing impacts with downstream fish habitat. Within allotments, KNF range personnel have identified areas of high or medium use. Forage utilization in "high use" areas is usually 50% or greater in years that grazing occurs, while "medium use" normally exhibits 35-50% utilization. High use areas may also include a history of overutilization. Concentrated use areas (see **Appendix A**) are typically meadows associated with a water source. The water source may be a spring or seep that dries before or shortly after leaving the meadow, and are thus disconnected from conveying grazing impacts downstream. Only concentrated grazing use locations which exhibit connectivity with downstream habitat, and therefore have the potential to affect fish and fish habitat, are defined to be aquatic emphasis areas, and will be tracked through the analysis process. Prominent concentrated use areas, such as the unnamed meadow complex east of Browns Knob, are eliminated from further analysis consideration because there is no aquatic connection downstream/downslope. See **Table 4** and **Maps 7, 8** for Project emphasis areas. Additionally, **Appendix A** provides a brief description of all locations of concentrated use.

Table 4. Aquatic emphasis areas, including general location, use level, and acres.

Allotment	Aquatic Emphasis Area[1]	General Location	Use Level	Acres
Lake Mountain	"Kuntz Meadow"	Kuntz Ck headwaters	High Medium	11.6 68.6
Middle Tompkins	"McCarthy Meadow Complex"	McCarthy Ck headwaters	Medium	5.6
	"Rancheria Spring Complex"	Rancheria Ck headwaters (north)	Medium	17.6
	"Maple Spring Complex"	Rancheria Ck headwaters (south)	Medium	11.6
	"Faulkstein Camp Meadow"	Fish Ck headwaters at Faulkstein Camp	Medium	20.1
	Tyler Meadows	Tyler Meadows Ck headwaters	High Medium	13.3 10.7
	"Tompkins Meadows Complex"	Unnamed Tompkins Ck tributary headwaters	Medium	26.8
	Middle Meadow	Middle Meadow (unnamed Middle Ck tributary)	High	17.0

[1]Most meadows and forage concentration areas do not have formal place names. Except for Middle Meadow and Tyler Meadows, all names are as used by KNF range personnel and other staff.

Monitoring data shows that locations that receive low use (less than 35% utilization) are not likely to approach any Project standards that will trigger administration of adaptive management actions. There is no probability that impacts to downstream fish habitat would initiate from low use areas, therefore this analysis focuses on high and medium use sites. In wet meadows, impacts could only occur if these areas were heavily stocked and over-grazed without much rest. Since the Project does not involve heavy grazing (numbers are low, period of rest is long, and annual utilization monitoring eliminates heavy grazing), there is no probability that grazed wet meadow areas without cattle-accessible stream channels could impact downstream fisheries habitat.

Neither Middle Creek nor Tompkins Creek within fish occupied areas are aquatic emphasis areas. No concentrated use areas have been identified along the streams. With focus specifically on Tompkins Creek due to presence of Coho and its Critical Habitat, although GIS modeling indicate it to be "capable" of grazing use, visitation by the District Fish Biologist has found forage suitability to be low due to a dense riparian overstory limiting grass/herb growth, and accessibility for cattle would be difficult due to topography, as well as the large percentage of cobbles and boulders comprising the banks (**Photo 2a, b**). The observation of limited forage availability is supported via a summary report to NMFS for ten years of monitoring (1998 to 2008) for Middle Tompkins Allotment (USFS 2009). Middle Creek models less capability than Tompkins Creek; general habitat observation of Middle Creek by the Fish Biologist has determined lack of suitability for cattle along this stream; and roads and/or capable habitat stringers which could lead cattle to fish occupied areas are limited. Any use by livestock of Middle Creek or Tompkins Creek within fish occupied areas is expected to be incidental. Fleeting use may occur when cattle are gathered and actively moved along the road system, over Tompkins Creek via a bridge on 46N64, and up on the ridge. Otherwise, animals are expected to graze on the more open upper slope and ridgetop areas.

Cattle grazing in general forested areas, which comprise the majority of acreage in the allotments, is dispersed and minimal and not considered to be a potential trigger for effects to aquatic habitat or watershed processes. Riparian areas outside the primary meadows tend to be inaccessible to cattle due to steep slopes and rocky areas, and therefore could not be affected by the Project.


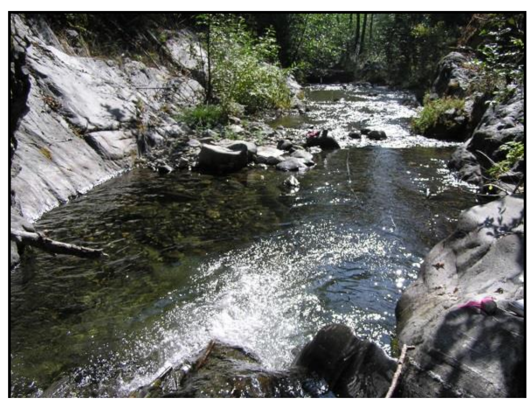

Photo 2a & 2b. Typical mainstem Tompkins Creek habitat conditions, including rocky banks and dense riparian overstory limiting development of livestock forage.

2014 Happy Camp Complex Fire

The Happy Camp Complex Fire burned approximately 117,000 acres in summer 2014 upon three Ranger Districts of the Klamath National Forest. The entirety of both allotments comprising the Project area were affected. In general, the Project area experienced a mosaic burn, with most locales exhibiting either low burn severity or no burn, with vegetation expected to return to pre-fire condition within a few years. Locales of moderate and high burn severity are also present.

Aquatic emphasis areas were minimally affected. Where impacts occurred, burning was light and generally restricted to meadow grass and peripheral trees and brush. Conditions within and in channels immediately downstream of emphasis areas are largely as observed pre-fire. At some sites, such as below Middle Meadow, in-channel woody debris were burned, but future input from fire-weakened trees is anticipated to eventually compensate. Therefore, descriptions of aquatic emphasis areas provided in **Appendix B** remain valid. Fire effects are expected to primarily resolve at the landscape scale, and will be discussed, where relevant, within the appropriate Indicator.

To allow for post-fire recovery of vegetation and silviculture activities (e.g., fire salvage harvest, hazard tree removal, ground preparation for tree re-planting), livestock use will be modified within the Project area (McMorris, pers. comm.). For Middle Tompkins allotment, livestock will not be authorized until 2016. Lake Mountain allotment will be grazed in 2015, but animals may be turned out at a later date and/or the season may be shortened in the fall. These are the minimum modifications for livestock use, with post-fire range conditions subsequently informing management.

--Existing Conditions – Analysis Indicators--

Only Indicators potentially affected by the Project and, therefore, introduced in the "Methodology" section, are further discussed here prior to analysis within "Environmental Consequences". Indicators are generally applied only to anadromous systems. A summary of all discussed Indicators is presented in **Table 6**. See **Appendix D** for a list of remaining Indicators and their relationship to baseline conditions.

Temperature

Most streams in the Project area are considered to be "Properly Functioning" for water temperature. The exceptions are Scott River and Klamath River, both of which typically have elevated summer temperatures, potentially lethal to salmonids, due to the cumulative human impacts of dam impoundments, agriculture, clearing of riparian vegetation, and other factors.

Tompkins Creek has fish habitat, including Coho Critical Habitat, within Project boundaries. Although this stream is "Properly Functioning" as per the Northwest Forest Plan AP, it also exhibits slightly elevated temperatures in regards to State of California beneficial uses (Laurie 2012; USFS 2014a). However, this elevation is not regarded as abnormal and is a reflection of past flood events - in particular, 1964 and 1997 - scouring the banks and removing riparian vegetation (USFS 2014a). Long term recovery is ongoing (see **Photo 3a, b**), and water temperature is expected to slowly decrease over time (decades) as the canopy continues to fill in, assuming no additional flood impact.

While there is little to no data, other drainages within the Project area also likely exhibit a similar natural slight increase in temperate, albeit insufficient to impact fisheries.

Grider Creek has fish habitat, including Coho Critical Habitat, downstream from the Project/allotment boundaries. Similar to Tompkins Creek, temperatures (as taken near the mouth, over 9 miles downstream of the Project area) are elevated in regards to State of California beneficial uses, but are still considered “Properly Functioning” as per the Northwest Forest Plan AP (Laurie 2012; USFS 2014a). Shade reduction due to flood scour is likely the primary agent of elevated temperatures, although past logging within the drainage, as well as existing riparian alteration on private property. It is expected that water temperatures closer to the project area, and therefore higher in the drainage, are cooler than those near the mouth.

Happy Camp Complex Fire

A possible post-fire response is an increase in stream temperatures (Neary, *et al*. 2008). If this consequence occurs, and to what degree, depends upon amount of shading vegetation burned, as well as pre-existing factors such as topography and groundwater influence.

Within Project allotment boundaries, impact to the riparian area was generally light. For instance along mainstem Tompkins Creek, streamside understory plants such as vine maple and blackberry were burned, but overstory alder and conifer was left largely intact. Basil resprout of many understory species was occurring within a few weeks following the fire. Mortality of individual trees is expected, but not to the extent that stream shading is excessively affected and temperatures exhibit a meaningful biological impact. Brush and other understory plants are expected to recover to pre-fire conditions within a couple of years.

Elsewhere in the Happy Camp Complex Fire, and outside the Project boundary, areas of extensive riparian burn, including mortality to overstory vegetation, did occur. An example includes Grider Creek and many of its tributaries. Water temperature recovery to pre-fire conditions may require years to decades, depending on rate of riparian vegetation regrowth.

The current condition for the temperature Indicator has not been modified for this document due to the Happy Camp Complex fire. The fire only recently occurred, and the subsequent stream temperature response not able to be known at this time. Existing Forest temperature monitoring will track changing conditions in Grider Creek, O’Neil Creek, and Tompkins Creek. If conditions in the future are found to have changed from the current baseline, then appropriate adjustments to the Indicator status will occur.

Turbidity and Sediment/Substrate

The turbidity and substrate Indicators are discussed together due of their close relationship. Existing conditions are based upon CWE modeling and substrate data, where available, as well as professional judgment and observation. See “Disturbance History and Regime” subsections for further discussion of CWE models.

Tompkins Creek is considered to be “Functioning-At-Risk” for both turbidity and substrate Indicators. Although none of the CWE models indicate an elevated risk of surface erosion or mass wasting, sediment surveys and field observation suggest that an elevated amount of finer substrates are present within the substrate composition. The smaller substrate classes are of greatest interest because such material may either directly contribute to turbidity, else represent the presence of material easily mobilized during appropriate discharge conditions. A recent survey in 2011 detailing pool volume (V*) and surface/subsurface sediment composition reported the percentage of substrate finer material was elevated in comparison to reference conditions (USFS 2013). Additionally, in 2013, the District Fish Biologist walked approximately one mile of mainstem Tompkins Creek, beginning at the downstream allotment boundary. Numerous slumps and raw banks were observed. Erosion primarily appeared to be continued long-term impact from past flooding, although at least one slope failure from an abandoned road was noted (pers. obs.).

The status of Tompkins Creeks is considered to be a lingering effect of flood, as well as reflection of past timber practices and the current and legacy road system. Impacts to physical channel attributes are not associated with livestock, except potentially within areas of livestock concentration (USFS 2014a). Except for meadow areas, cattle generally do not have good access to creeks within the Project area due to steep slopes, rock, and/or thick riparian brush, and where access is possible outside of meadows, flood scour has hardened banks and channel bottom by exposing cobble and boulder. The long-term recovery of Tompkins Creek from the 1997 flood has been captured via the series of photos taken at the NMFS monitoring site near the Tompkins Creek Corral (**Photo 3a, b**).

Grider Creek is considered to be “Properly Functioning” for both turbidity and substrate Indicators. A 2009 pool volume and sediment composition survey reported the percentage of finer substrate material to meet reference conditions (USFS 2013). Furthermore, CWE models for the upper Grider Creek watershed are below the “1” risk threshold.

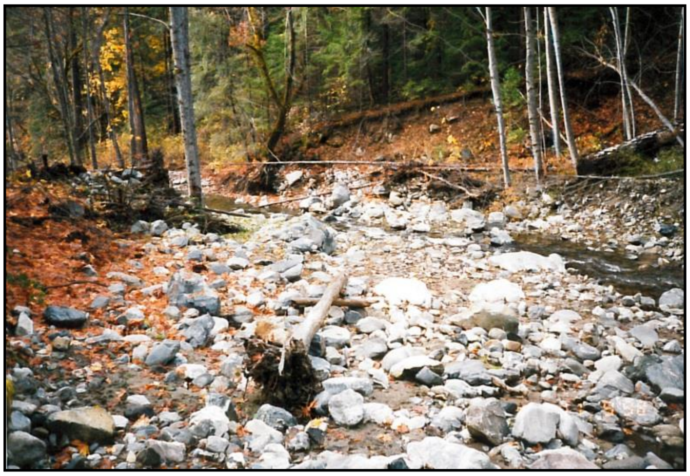

Photo 3a & 3b. Mainstem Tompkins Creek - NMFS monitoring photo point site. Documentation of recovery from 1997 flood between 1998 (upper) and 2013 (lower).

Happy Camp Complex Fire

A potential landscape post-fire response is sediment mobilization (Neary, *et al*. 2008). This can occur catastrophically from debris flows, else more generally due to the overland movement. The risk and amount of sediment mobilization decreases over time as vegetation recovers (Neary, *et al*. 2008). Factors such as burn severity and extent, underlying geology, and degree of intact riparian vegetation determine how much sediment actually enters stream systems to impact the local aquatic habitat and ecosystem.

Creeks within and adjacent the Project affected by the 2014 Happy Camp Complex fire displayed elevated and lingering levels of turbidity following fall and winter rain events, compared to pre-fire conditions. This observation was expected due to the initial mobilization of ash and other fine material (Neary, *et al*. 2008). How long this change in turbidity persists for a given drainage is variable, but is related to burn severity and amount of drainage affected (Rhoades, *et al*. 2011; Neary, *et al*. 2008). Turbidity due to ash input was observed to diminish quickly as normal winter precipitation and spring run-off flushed systems. However, in some locations, conditions of elevated turbidity may continue to intermittently persist if post-fire impacts include alterations in substrate composition that increase the amount of fine sediment.

Concerning catastrophic risk of sediment input within the Lake Mountain/Middle Tompkins Allotments Project area, the drainage at highest risk for post-fire debris flow is Grider Creek, with Tompkins Creek and O'Neil Creek of lower risk (USFS 2014c). The risk assessment model for debris flow is based upon the probability of a 5-year storm event within the first year following the fire, and as such there is no certainty that catastrophic impact will occur. Caveat provided, there was wide-spread occurrence of fire in the Grider Creek drainage, although the highest severity areas that contribute to elevated risk generally occur outside the Project area. Tompkins Creek and O'Neil Creek exhibit a much less elevation of risk.

Fine sediment yield is expected to increase throughout the fire area. Specifics are unknown, but those drainages with more and higher severity burned areas should exhibit a greater response. Within the Project boundary, vegetation associated with perennial and intermittent channels either did not burn, else endured low burn severity (USFS 2014d). Intact riparian vegetation can moderate post-fire impacts by filtering overland movement of sediment.

The current condition for the turbidity and substrate Indicators have <u>not</u> been modified for this document due to the Happy Camp Complex fire. The fire only recently occurred, and as such many "what-ifs" based upon landscape response to weather and seasonal considerations has yet to occur. Both direct effects (e.g., rain events) and indirect effects (e.g., time to vegetation recovery) have an influence upon turbidity and substrate composition. Existing Forest sediment monitoring will track changing conditions in Grider Creek and Tompkins Creek, CWE models are updated annually, and personal observations will continue. If conditions in the future are found to have changed from the baseline, then appropriate adjustments to the Indicator status will occur.

<u>Chemical Contamination/Nutrients</u>

For nutrients, most aquatic systems within the Project 7th- and 5th-order drainages are considered to be "Properly Functioning". No sources of contamination have been identified by the KNF. The exceptions to the above condition are the Scott River mainstem and Klamath River mainstem, both of which are "Not Properly Functioning".

A segment of mainstem Scott River under the 2012 303(d) list is listed for the water quality concern of "biostimulatory conditions" (CRWQCB 2014). This category is a general term for any process, including nutrient enrichment, that may promote aquatic growth to where it becomes a nuisance or causes adverse effects to beneficial uses. It is used when the causal agent for algal blooms may not be readily apparent or able to be linked to a specific source. The specific segment listed for the Scott River is "Young's Dam to Boulder Creek". While this reach is technically outside the Project area, it is upstream of it and there is no barrier for any effects originating thereof to affect the downstream Scott River within the Project area.

The 2012 303(d) list cited Klamath River, including the reach adjacent to the Project area, as possessing "nutrient" and "organic enrichment" concerns. These pollutants are restricted to the mainstem except where tributaries are specifically named. There are no

Klamath River tributaries listed for nutrients or organic enrichment within the Project area.

Streambank Condition

Streambank assessment of stability has been minimal in the Project area. The few surveys and assessments available suggest that stability in most places is either “Properly Functioning” or “Functioning-At-Risk”. The latter evaluation is primarily due to lingering flood effect – 1964, 1997, 2006 – with channels demonstrating long-term natural recovery.

An example of “Functioning-At-Risk” within fish-occupied habitat is **Tompkins Creek** mainstem. Flood scour impacted the channel and reduced banks in many places to boulder and large cobble. While these substrates are good components in regards to bank stability, flood also affected the very steep and high banks present along the stream. These locations continue to exhibit raveling and other signs of active erosion, particularly following spring run-off. The 2000 Lower Scott River Ecosystem Assessment found Tompkins Creek to be “Not Properly Functioning”, but that determination was based upon surveys conducted in 1997, less than a season following the flood. Since then, most banks have stabilized and revegetated, but segments of raw bank persist. Additional to flood impact, there are several short segments where the road which parallels the creek affects the stream, including the banks, although the overall amount is small because the road is typically set back at least 100 feet.

Grider Creek fish-occupied habitat, in contrast to Tompkins Creek, is “Properly Functioning”. The Grider Creek channel has also been affected by flood. However, because the valley walls tend to be set back from the creek, there are few instances of high, actively erosive banks raveling material directly into the stream. Otherwise, streambanks are comprised of bedrock/boulder/cobble substrate which is resistant to high water events, and riparian vegetation has recovered from past flood scour. Except for access to private property and a campground within the lower three miles of Grider Creek, Grider Creek is largely roadless. The road that follows lower Grider Creek is set back far enough from the channel that it does not affect streambanks.

Streambanks in most aquatic emphasis areas are considered to be in good condition (USFS 2014a; pers. obs.). Banks are well vegetated, with minimal erosion; and in many places a thick streamside alder component restricts animal access as well as provides for bank stability. An exception is Faulkstein Camp Meadow (Middle Tompkins Allotment), where an active headcut is present, along with other channel adjustments and signs of past stabilization efforts. The headcut is unlikely to have initiated due to livestock. While no definitive history on the headcut is available, evidence suggests that historic timber harvest practices, such as using stream channel for skidding, may be responsible. However, it is possible that past livestock use may have enhanced or exasperated the headcut.

Disturbance History and Regime

A “Properly Functioning” disturbance regime includes stable natural processes and hydrograph, where high quality habitat and watershed complexity provides refuge and rearing for all life stages or multiple life-history forms; and all three cumulative watershed models should be below the “1” threshold. Alternately, for a “Functioning-At-Risk” disturbance regime, the frequency, duration, and magnitude of disturbance events have the potential to be moderately departed from the reference condition due to human-mediated or other landscape scale impacts upon the watershed; and one or two of the models may be over threshold. Finally, a “Not Properly Functioning” disturbance regime is described as a watershed with disturbance events significantly departed from reference condition as a consequence of past/current human activities or other influences; and all three models are over threshold. See **Appendix C** for additional CWE information.

All drainages in the Project area were affected to some extent by the 2014 Happy Camp Complex. Post-fire, four 7th-field watersheds are “Properly Functioning” and five are “Functioning-At-Risk” (**Table 5**). Prior to the fire, two drainages – Deep Creek-Scott River, O’Neil Creek – were “Functioning-At-Risk” via modeling; with Tompkins Creek joining due to professional judgment. Deep Creek-Scott River was elevated in regards to the GEO component, which was due to geology, wildfire, and past timber harvest. In contrast, O’Neil Creek was just barely over threshold for the USLE component, the reason of which was not immediately clear, but was perhaps related to management decisions which have occurred within the drainage. On the other hand, **Thompkins Creek** drainage is a special case. Although the CWE models are all below threshold (including pre- and post-fire), professional judgment that past and current impacts related to timber harvest, roads, flood, and the interactions between these and other elements suggest the watershed is better represented by a “Functioning-At-Risk” category.

Table 5. Baseline and post-Project cumulative watershed effects. Risks over the "1" threshold are bolded.

Watershed	Acres	Baseline (post-fire)				Post -Project		
		ERA	%ERA	TOC	Risk	ERA	%ERA	Risk
7th-Field Watershed(s)								
Deep Creek-Scott River[1]	3798	149.8	3.9%	9.0%	0.44	*No conc. use areas*		
McCarthy Creek-Scott River[1]	11680	555.4	4.8%	9.5%	0.50	555.6	4.8%	0.50
Middle Creek[1]	4498	264.4	5.9%	8.5%	0.69	265.6	5.9%	0.69
Tompkins Creek[1,3]	9327	380.8	4.1%	7.5%	0.54	382.3	4.1%	0.55
O'Neil Creek[2]	2429	155.9	6.4%	8.0%	0.80	*No change to baseline*		
Rancheria Creek[2]	4374	269.5	6.2%	7.0%	0.88	*No change to baseline*		
Tom Martin Creek-Klamath River[2]	10690	518.1	4.8%	9.0%	0.54	*No change to baseline*		
Schutts Gulch-Klamath River[2]	6692	356.2	5.3%	9.0%	0.59	*No change to baseline*		
Upper Grider Creek[2]	8467	261.3	3.1%	7.5%	0.41	*No change to baseline*		
5th-Field Watershed(s)								
Lower Scott River	97600	4651	4.6%	8.6%	0.55	*No measurable change*		
Seiad Creek-Klamath River	81706	3715	4.5%	8.3%	0.55	*No measurable change*		

[1]Middle Tompkins Allotment - existing KNF baseline used; post-Project adjusted to illustrate minimal change due to resumption of grazing

[2]Lake Mountain Allotment - baseline adjusted to include grazing

[3]Increase to Tompkins Creek risk output is due to rounding. Actual calculated change to risk is 0.002 difference, which is too small to translate to on-the-ground effect to discharge or other habitat values.

Watershed	Acres	Baseline (post-fire)		Post-Project	
		USLE Risk	GEO Risk	USLE Risk	GEO Risk
7th-Field Watershed(s)					
Deep Creek-Scott River	3798	0.52	**1.39**	*Models not affected by grazing*	
McCarthy Creek-Scott River	11680	0.48	0.43		
Middle Creek	4498	0.87	**1.09**		
Tompkins Creek	9327	0.86	0.85		
O'Neil Creek	2429	**1.37**	**1.50**	*Models not affected by grazing*	
Rancheria Creek	4374	**1.14**	0.68		
Tom Martin Creek-Klamath River	10690	0.78	0.44		
Schutts Gulch-Klamath River	6692	0.71	**1.15**		
Upper Grider Creek	8467	0.50	0.31		
5th-Field Watershed(s)					
Lower Scott River	97600	0.48	0.57	*Models not affected by grazing*	
Seiad Creek-Klamath River	81706	0.68	0.82		

Peak/Base Flows

Most 7th-field watersheds within the Project area are considered "Properly Functioning", with the following exceptions:

- **O'Neil Creek** – "Functioning-At-Risk" – Although the ERA model is below critical threshold, the existing road density is high (greater than 3 miles per square mile), particularly in the headwaters (USFS 1999c). Due to the history of the area, including mining and timber harvest, additional abandoned roads are also expected to be present upon the landscape. Riparian vegetation is good, but is likely still recovering from past flood impacts.
- **Tompkins Creek** – "Functioning-At-Risk" – Although the ERA model is below critical threshold, the existing road density is moderate (USFS 2000). Of particular interest, a diversion is present on Tompkins Creek just below the Tompkins Creek Corral. The diversion redirects water to private property downstream of the Project area. It is believed that diversion operation may have recently changed (e.g., within last five years). In contrast to past notes and surveys associated with Tompkins Creek not expressing concern with flow due to diversion operation, observations made in the last several years haven noticed changes. For example, up to 80% of stream flow was diverted during the 2014 summer (pers. obs.); and the 2013 Coho spawning season saw fish preferentially attracted to the diversion outflow at the Scott River because insufficient water was flowing through the Tompkins Creek channel (M. Knechtle, pers. comm.).

Table 6. Baseline for analysis Indicators for anadromous streams in the Project area. (Klamath River not included - see Appendix D for details).

Stream/River	Temperature	Turbidity	Sediment / Substrate	Chemical / Nutrients	Streambank Cond.	Disturbance History / Regime	Peak/Base Flows
Grider Creek	P	P	P	P	P	P	P
Macks Creek	ND	P	ND	P	ND	P	P
O'Neil Creek	P	FAR	FAR	P	P	FAR	FAR
Rancheria Creek	ND	P	ND	P	ND	FAR	P
Tompkins Creek	P	FAR	FAR	P	FAR	FAR	FAR
Scott River	NF	FAR	NF	NF	NF	FAR	FAR

P - "Properly Functioning"
FAR - "Functioning At-Risk"
NF - "Not Properly Functioning
ND - No data available

Environmental Consequences

Alternative 1 – No Action [No Grazing]

Direct Effects and Indirect Effects

Under the No Action alternative, livestock grazing will be discontinued on Lake Mountain and Middle Tompkins allotments. Connected actions, such as the Lookout Spring redevelopment and Faulkstein Camp Meadow exclosure construction, will not occur.

There would be no direct effects to fish or fish habitat.

Lake Mountain Allotment

Indirect effects as examined under Alternative 2 would cease. Of the Indicators discussed, only “Chemical/Nutrients” and “Disturbance History/Regime” apply to Lake Mountain Allotment. Because livestock-associated nutrient input would no longer occur, there would be insignificant positive effects of this Indicator to aquatic emphasis areas above fish habitat, although effects downstream in fish occupied reaches would not be expected to be meaningfully detected. Similarly, the baseline for the ERA model would be adjusted to reflect cessation of grazing (see “Disturbance History and Regime” discussions), although the beneficial impact would be so small as to be indiscernible from natural background variability.

Middle Tompkins Allotment

Middle Tompkins Allotment has not been grazed since 2007, and, therefore, removal of livestock would not alter the existing condition. Consequently, this Alternative will not result in any indirect effects to this allotment, beneficial or adverse.

Cumulative Effects

There will be no cumulative adverse impacts to fisheries resources from the No Action Alternative. Without direct effects, and either beneficial or no indirect effects, there cannot be adverse cumulative effects.

Lake Mountain Allotment

All insignificant beneficial effects are restricted to Lake Mountain Allotment because only this allotment would undergo management change to discontinue grazing. Without direct effects, and only beneficial cumulative effects within the footprint of future foreseeable actions, there cannot be adverse cumulative effects.

Middle Tompkins Allotment

Middle Tompkins Allotment has not been grazed since 2007, and, therefore, removal of livestock would not alter the existing condition. Consequently, this Alternative will not result in any indirect effects, unlike the Lake Mountain Allotment. Without direct or indirect effects within the footprint of future foreseeable actions, there cannot be cumulative effects.

Alternative 2 – Proposed Action

Direct Effects

Direct effects to aquatics will not occur because livestock will not overlap with fish or fish habitat when the most vulnerable lifestages – eggs and fry in redds – are expected to be present. Within the Project area, the potential for direct exposure is limited to Mill Creek (Lake Mountain Allotment), and Tompkins Creek and Middle Creek (Middle Tompkins Allotment).

Lake Mountain

Within Lake Mountain Allotment, Mill Creek has the potential for direct exposure in regards to resident rainbow trout because distribution occurs within allotment boundaries. However, the earliest cattle are introduced to the allotment is July 1st, which is after when trout will have emerged from redds in Mill Creek. Furthermore, livestock would not be expected along Mill Creek where trout distribution does occur due to lack of forage, as well as steep topography and lack of travel corridors (e.g., roads or strips of capable forage) linking concentrated use areas with Mill Creek.

Middle Tompkins

Within Middle Tompkins Allotment, Tompkins Creek and Middle Creek have the potential for direct exposure. The former includes anadromous species within allotment boundaries, and both have resident rainbow trout. For Tompkins Creek, few Coho, steelhead, or rainbow trout redds are observed when surveys occur. By the time livestock are permitted on Middle Tompkins Allotment, young fish are expected to have emerged from the gravel and be mobile. Even if fish were late in emerging, early season movement of livestock in the allotment is to actively herd them up and away from Tompkins Creek towards water and forage on the eastern ridgelines. Livestock are not brought to the south side of the allotment – i.e., Middle Creek drainage – until mid-season (June or July), when salmonids would be out of redds. Lastly, access to the creek for cattle in both drainages is difficult for cattle, and as expectation of extensive pockets of forage along the mainstems is low, and livestock will be actively herded with crossing Tompkins Creek via a bridge, the possibility of livestock loitering near and/or entering Tompkins Creek, and thereby having any direct effects on fish, including Coho Salmon, or their habitat, is negligible.

Indirect Effects

Only concentrated grazing use locations which exhibit connectivity with downstream fish habitat have the potential to affect fish and habitat; these are referred to as aquatic emphasis areas (**Table 4; Table 7**). The following analysis tracks effects that may occur at aquatic emphasis areas, and how these effects may or may not be expressed downstream in fish habitat.

Table 7. Aquatic emphasis areas tracked in the indirect effects analysis.

Allotment	Aquatic Emphasis Area	Use Level	Acres	Fish Occupied System (Dist to Nearest Habitat)
Lake Mountain	"Kuntz Meadow"	High Medium	11.6 68.6	Kuntz Creek (3.4 miles)
Middle Tompkins	"Faulkstein Camp Meadow"	Medium	20.1	Fish Creek (1.8 miles)
	"Maple Spring Complex"	Medium	11.6	Rancheria Creek (2.9 miles)
	Middle Meadow	High	17.0	Middle Creek (0.4 miles)
	"Rancheria Spring Complex"	Medium	17.6	Rancheria Creek (3.4 miles)
	Tyler Meadows	High Medium	13.3 10.7	Tyler Meadows Creek (2.0 miles)
	"Tompkins Meadows Complex"	Medium	26.8	Tompkins Creek (0.8 miles)

--Salmonids--

Temperature

Within aquatic emphasis areas, stream shade may be affected, but it will be localized and limited in extent. Open meadows where shade is created by overhanging banks and herbaceous vegetation potentially have the greatest exposure to grazing. However, stubble height restrictions limits amount of grass canopy removed; and effects to streambanks are expected to be minimal (see “Streambank Condition” Indicator). In many aquatic emphasis areas, dense thickets of alder and/or willow are present. These thickets not only provide stream shading, but maintain well stabilized banks and restrict streamside access by livestock. Some brush browse may occur, but it will be on the outer edge of the thickets, and not affect shade.

Water temperature is more complex than just vegetation, and can include factors (not an exhaustive list) such as topography; global latitude; east/west versus north/south aspect; stream width compared to riparian height; and inflow from groundwater, tributaries, and springs (Moore, *et al*. 2005; DeWalle 2008). There may be localized increases in insolation within aquatic emphasis areas as a result of grazing, but any increases in water temperature will be minimal, offset by downstream shade and groundwater/spring input. Overall, there will be no impact to water temperature at the watershed scale (USFS 2014b). Any localized impact to water temperature would be negligible and not biologically meaningful in downstream fish-bearing reaches because the closest aquatic emphasis area to Coho and Critical Habitat is 1.9 miles; to anadromy is 1.1 miles; and to resident rainbow trout is 0.4 miles.

In summary, while there may localized impacts to shade as a result of livestock grazing, it will be limited in extent with no effect to water temperature for either fish or fish habitat, including Coho and its Critical Habitat.

Turbidity and Sediment/Substrate

Neither current nor recent monitoring indicate bare streambanks to be of concern within the allotments in concentrated use areas (USFS 2014b; McMorris, pers. comm.); and utilization standards are designed to minimize detrimental impact to the grasses and shrubs which provide streambank cover. The incidence of raw banks is therefore expected to be localized and limited – e.g., livestock crossings, watering accesses, and similar.

Some localized mobilization of fine sediment may occur within areas of concentrated use, but allotment management practices, such as season-of-use and stubble height limits, will avoid alteration of channel attributes (USFS 2014a). Mobilization of sediment is expected to be less than 300 feet, beyond which any alterations to sediment composition will not be measurable from background variability. Furthermore, any channel alteration which may occur within aquatic emphasis areas as a result of grazing will not propagate downstream to fish-occupied habitat because of channel stability provided by rock, large woody debris, thick alder/willow thickets, or a combination thereof.

Within the Project area, the closest aquatic emphasis area to Coho and Critical Habitat is 1.9 miles; to anadromy is 1.1 miles; and to resident rainbow trout is 0.4 miles. All distances are well beyond those where that turbidity or fine sediment mobilization would be detectable.

Following the 2014 Happy Camp Complex, aquatic emphasis areas and Tompkins Creek mainstem were reviewed. Although there were locations where downed woody debris had been consumed, overall fire impact to aquatic emphasis sites and channels immediately downstream was minimal. Similarly, where riparian vegetation along Tompkins Creek was affected, it is expected to return to pre-fire conditions within the next several years. Therefore, the probability of livestock within concentrated use or sensitive areas augmenting post-fire sediment response is not expected.

An additional observation made post-fire was that several small alder adjacent to the 46N64 bridge over Tompkins Creek were cut to facilitate water tender access to the stream. Prior to the fire, the density of these alder lessened the probability that cattle would cross the creek beside the bridge, instead of on the bridge, when being herded between Middle Tompkins Allotment pastures. Until the alder recover, there is a higher probability livestock will trail through the creek, thereby producing a temporary increase in local turbidity as animals disturb streambanks and stream substrate. Active herding will insure that livestock stream access will be minimized.

In summary, except for the 46N64 road crossing, neither turbidity nor substrate impacts within fish habitat, including Coho Critical Habitat, are expected. Localized occurrence of raw banks resulting from livestock grazing may occur within aquatic emphasis areas. Where bare banks are observed, turbidity will be of short duration and spatially limited; and any changes to substrate composition will be localized and not propagate downstream. The exception is the 46N64 bridge due to removal of alder during fire suppression activities. Until the alder recovers to its pre-fire condition, livestock may be more likely to cross the creek directly, instead of utilizing the bridge, when being herded across the allotment. Though not expected, if this were to occur, any turbidity from this source would be of short duration (i.e., when animals are crossing) and limited in spatial extent. Similarly, alteration of substrate composition will be spatially restricted, with reversion to its customary character expected following annual high water events.

Chemical Contamination/Nutrients

Contamination of streams with excess nutrients, specifically nitrogen (N) and phosphorous (P) from cattle feces and urine is often a concern in rangeland management. If nitrogen and phosphorus are sufficiently elevated, grazing in the Project area could theoretically further encourage growth of algaes such as *Cladophora*, ultimately compounding the existing *C. shasta* issue. However, such is not expected to occur in the Project area. In general, mountainous headwater systems such as those in the Project area are N and P limited, and so these nutrients are quickly absorbed by plants, microbes, and other biota when available (Hill, *et al*. 2010; Peterson, *et al*. 2001). A comprehensive study which included examination of nutrient loading in grazed Forest Service allotments in northern California found them to be below the level of ecological concern; neither N nor P were significantly related to cattle density, head month, or grazing duration; and only in a few instances did N or P exceed recommended water quality benchmarks (Roche, *et al*. 2013). Other sampling of N and P within grazing allotments have also reported very low concentrations of these nutrients, sometimes below detection limits (EPA 1993; Adams, *et al*. 2009; Roche, *et al*. 2012).

An EPA report stated that unless fecal material is directly deposited into streams, the risk of nutrient enrichment is low, particularly for unconfined cattle grazing (EPA 1993). Cattle may deposit urine and fecal matter directly to streams only in areas where it is possible for animals to move down into stream channels to forage or cross the stream. Since the aquatic emphasis areas are the only locations where cattle are expected to concentrate in association with flowing water, the waste is expected to settle near where it is deposited. All aquatic emphasis areas are well away from fish habitat: the closest area to Coho and Critical Habitat is 1.9 miles; to anadromy is 1.1 miles; and to resident rainbow trout is 0.4 miles. Middle Creek and Tompkins Creek include fish habitat which is within an allotment and potentially directly accessible to cattle. However, due to lack of forage, dense riparian vegetation, and rocky bank substrate, livestock are not expected to linger. Furthermore in relationship to Tompkins Creek, when cattle are moved mid-season and end-season, they are actively herded, thereby reducing or eliminating the time when livestock can access the stream.

While there may be areas where nutrient impacts of Project cattle grazing are expected to be detectable, these will be associated with aquatic emphasis areas, which are distant from fish or fish occupied habitat. Elsewhere within the allotment, and especially in association with Tompkins Creek Critical Habitat, there is very low possibility of nutrient input. Expected uptake of nitrogen and phosphorus by local biota means that nutrients will remain below the level of ecological concern, thereby not contributing to enrichment of areas affected by pathogens such as the Klamath River.

In summary, the Project may cause insignificant effects to this Indicator in aquatic emphasis areas above fish habitat, and will not be meaningfully detected within fish occupied reaches.

Streambank Condition

There is no overlap of fish or fish habitat with aquatic emphasis areas.

Middle Tompkins Allotment includes fish and fish habitat upon Middle Creek and Tompkins Creek within the allotment boundary; and Lake Mountain similarly has Mill Creek. However, all streams have been impacted from past flood events. In particular, Tompkins Creek and Middle Creek have extensive lengths of exposed banks largely comprised of cobbles and boulders (**Photo 4**). Bedrock is also an intermittent component of the banks of these two systems. As cattle tend to avoid these substrate types where possible, access to the water is restricted; and while the occasional animal may enter the creek, these substrates armor the bank against damage.

Photo 4. Mainstem Tompkins Creek in vicinity of the corral at the NMFS monitoring photo point site. Note the bank composition of large rock, which is typical throughout the anadromous reach. Photo taken in August 2013.

During the 2014 Happy Camp Complex, several small alder adjacent to the 46N64 bridge over Tompkins Creek were cut to facilitate water tender access to the stream. Prior to the fire, the density of these alder lessened the probability that cattle would cross the creek beside the bridge, instead of on the bridge, when being herded between Middle Tompkins Allotment pastures. Until the alder recover, there is an increased possibility that livestock will trail through the creek during relocation herding, thereby impacting streambanks as animals enter and exit the water.

In summary, except for the 46N64 road crossing, no streambank impacts within fish habitat, including Coho Critical Habitat, is expected. While there is potential for localized bank impact within aquatic emphasis areas, impacts will not propagate downstream to fish habitat due to channel stability afforded from geology, wood debris, or existing vegetation (i.e., alder and willow). Upon Tompkins Creek, access to the mainstem is limited and substrate armors the bank from livestock damage. The exception is the 46N64 bridge due to removal of alder during fire suppression activities. Until the alder recovers to its pre-fire condition, livestock may be more likely to cross the creek directly, instead of utilizing the bridge, when being herded across the allotment. However, the effect to the streambanks will be localized and limited to when animals are being actively moved/herded.

Disturbance History and Regime

Livestock grazing does not affect either USLE or GEO models (Bell, pers. comm). These models are impacted by major ground disturbing activities, loss of large tree root structure, and loss of precipitation interception by vegetation. However, the Project neither proposes tree removal nor extensive ground disturbance, and nor will the level of grazing approach the point where herbaceous and brush species are detrimentally affected on a landscape level. Therefore, while several watersheds exhibit a USLE or GEO model over the "1" threshold, these deficits are either due to natural or human caused impacts. Livestock use will not increase these model values.

Grazing potentially affects existing Forest ERA models. However, the effect is often too small to be meaningfully detected from background variation and inherent model error. ERA model adjustments made for this Project occur in conjunction with concentrated use areas because these are the locations which would undergo the degree of compaction and ground disturbance to which the model is sensitive (USFS 2014a).

The current condition for Lake Mountain is an active allotment. Therefore, the **Table 5** ERA model baseline for this allotment has been adjusted to include grazing. The proposed action to reauthorize grazing within this allotment will use the same HMs. Although actions will be taken to improve livestock distribution in regards to the high-use area, the percentage of allotment this location represents is too small to cause a measurable change in the ERA model. Overall, no Lake Mountain Allotment watersheds are over the "1" threshold.

The current condition for Middle Tompkins is a vacant allotment (ungrazed since 2007). Therefore, pre-Project ERA model baseline (**Table 5**) is depicted as complete recovery from grazing. The resumption of grazing, using historic high- and moderate-use distribution, shows the minimal effect upon the landscape between the “no grazing” and “grazing” condition. The seeming increase to the Tompkins Creek watershed risk is a result of rounding: baseline/Project model difference is 0.002, which is similar to the other allotment watersheds and much too small to translate to an on-the-ground effect to discharge or other habitat values. In actuality, ERA model differences between pre- and post-Project may even be smaller than those calculated. The baseline assumption of complete recovery is for illustrative purposes only: it is unlikely that higher use areas will have had sufficient rest to allow natural processes to decompact soils due to the allotment’s long grazing history (Greenwood and McKenzie 2001; Drewey 2006). Overall, no Middle Tompkins Allotment watersheds are over the "1" threshold.

In summary, grazing will have no effect to existing disturbance indices as reflected in by CWE modeling. All ERA models are below the "1" threshold; and while multiple watersheds have a USLE or GEO baseline over the threshold, grazing will not cause additional impact.

Peak/Base Flows

At the site level, there will be no change in peak/base flows as a result of Project activities. The private property users of the Tompkins Creek diversion do not graze livestock on Forest, and nor are they associated with allotment permittees. Therefore, there will be no change in diversion amount nor season of use for Tompkins Creek as a result of this Project. Elsewhere in the Project area, no diversions will be built.

On the watershed-scale, the ERA model can be used in a generalized manner to consider a Project impacts to flow. A risk level of “1” is the interference threshold point at which flow impacts may be starting to occur. As the ERA risk level is below “1” for all Project watersheds, no changes in peak/base flow are expected (see “Disturbance History and Regime” subsection).

In summary, there will be no change to peak/base flows, either at site level or watershed-scale, due to the Project.

--Lamprey--

For lamprey, indirect effects to habitat is anticipated to be similar to those listed for salmonids. Additional focus herein is upon changes in substrate composition and the potential effect to ammocoetes (larvae). Because the larvae of both lamprey species require patches of soft sand or mud in which to burrow, actions that decrease these materials has the potential to affect local distribution and abundance of ammocoetes. However, such is unlikely to occur as a result of the Project. As analyzed for salmonids, alteration to substrate composition is not expected. Therefore, material suitable for ammocoete rearing will continue to be available.

More important than the effect of individual project components to lamprey is the effect of the Project to stream habitat as a whole. Maintenance of lamprey habitat and abundance best occurs in a heterogeneous system, one which encompasses complex instream features at multiple spatial scales (Torgensen and Close 2004). The Project will maintain a complex habitat for salmonids; and in doing so, will also benefit lamprey at all life stages.

Cumulative Effects

Cumulative effects analysis under NEPA:

> Focus includes past and foreseeable Federal actions, as well as incorporation of non-Federal activities. To understand the contribution of past actions to the cumulative effects of the proposed action, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

Cumulative effects analysis for ESA is a subset of the NEPA analysis and is focused upon Endangered, Threatened, and Candiate species. The ESA cumulative effects analysis is located in the Project Biological Analysis document.

NEPA Cumulative Effects

Within the Project area, there are no foreseeable non-Federal (i.e, private or State) actions planned at the time of this document.

Within the Project area, the Westside Fire Recovery Project is a Federal action currently being implemented. This project is a response to the 2014 wildfires which occurred on the KNF, including the Happy Camp Complex. The project includes the following actions – salvage timber harvest (excluding hydrologic Riparian Reserves), hazardous fuels reduction, hazard tree removal, and site preparation and replanting. Additionally, legacy sites – locations that exhibit an elevated level, or risk thereof, of erosion, especially finer sediments, as a result of past or existing human activities – are to be treated. A previously signed project – Eagle Springs Roadside Hazard Tree – was incorporated into Westside Fire Recovery planning due to expansion of post-fire hazard tree abatement need.

Westside Fire Recovery actions potentially overlap with Lake Mountain and Middle Tompkins Allotment Management Plan. Interaction will most strongly occur with project elements that create or expand transient range via the encouragement of new forage, especially grasses, by removing competing vegetation and allowing increased sunlight to reach the forest floor. Precriptions that entail clearing or thinning brush and small trees, followed by underburning or broadcast burning, will produce the most suitable conditions for transient range. Elements most likely to promote transient range are salvage harvest, site preparation, and hazardous fuels treatment. The degree of creation or expansion of transient range will depend upon pre-fire seedbed and impact of fire upon it, shading, location upon the landscape (microclimate), and specific prescription for a given project unit.

To access salvage and replanting sites, Westside Fire Recovery includes construction of new temporary roads and reopening routes used in past projects. This action is expected to attract livestock. Old roadbeds which have become sufficiently vegetated to suppress grasses will be bladed, which in turn will remove competition and allow sunlight penetration, thereby encouraging new grass growth. Because cattle forage along the sides of established roads throughout the Project area, it is expected animals will take advantage of this new resource. Grazing along temporary roads is not expected to directly or indirectly affect aquatic habitats because proposed accesses are midslope or ridgetop in position and do not cross intermittent or perennial channels. However, temporary roads could allow wider dispersal of animals within the allotment, as well as leading them to areas not regularly exploited in the past, thus altering livestock use patterns.

The cumulative effect to aquatic resources from this Project in addition to Westside Fire Recovery is uncertain. Cumulative impact occurs when the effects of one project overlaps with or compound the effects of another. The primary interaction between effects from of the two projects is (1) expansion of transient range beyond that expected to occur naturally post-fire and (2) encouragement of livestock to move to areas of the allotments not utilized in the past by following new forage opportunities along temporary roads. Westside Fire Recovery units are generally mid- to upper-slope, avoiding most aquatic emphasis areas; and although salvage harvest will not occur within any hydrologic Riparian Reserve, other project elements, such as site preparation and hazardous fuels treatment, will happen to some extent. The most likely scenario for interaction is for livestock to spread out upon the landscape to take advantage of transient range, with animals returning to patterns similar to pre-fire as transient range opportunities decrease. Where temporary roads access Westside Fire Recovery units, these routes will not lead cattle to sensitive fish-occupied locales, such as mainstem Tompkins Creek. There is some uncertainty of how livestock will respond to proposed treatments so the cumulative impact to aquatics cannot be definitively stated, but it will likely be insignificant to undetectable.

In summary, while the degree of adverse cumulative impact from future foreseeable Federal actions to anadromous salmonids, Forest Service Sensitive species, and Management Indicator Species, is uncertain, it is likely insignificant to undetectable.

Compliance with Law, Regulation, Policy, and the Forest Plan

The Alternative will meet Forest Plan Standards and Guides, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, Northwest Forest Plan, and all other relevant regulations, laws, and policies. Section 7 consultation will be completed with the National Marine Fisheries Service.

Table 8. Summary of the effects of each Indicator on salmonid fish of Alternative 2 of the Lake Mountain and Middle Tompkins Allotment Management Plan Project for project element/Indicator combinations. Indicator applies to both anadromous and resident fish, unless specified otherwise.

Indicators	Adaptive Management	Boundary Adjustment	Livestock Transport	Livestock Grazing	Monitoring	Exclosures	Comments
Temperature	0	0	0	-/-	0	0	Any localized changes in stream shading negligible and not detectable at watershed scale (USFS 2014b). **See text for additional discussion.**
Turbidity	0	0	0	-/0	0	0	Streams within fish habitat too rocky to respond to grazing; impacts to aquatic emphasis areas will not propagate downstream; potential short duration turbidity when cattle herded across Tompkins Creek.
Chemical Contamination	0	0	0	0	0	0	No chemical treatments will be used
Nutrients	0	0	0	-/-	0	0	Potential for inputs of cattle waste; unlikely to be discernable beyond the local scale
Physical Barriers	0	0	0	0	0	0	No barriers removed or constructed
Substrate	0	0	0	-/0	0	0	Streams within fish habitat too rocky to respond to grazing; impacts to aquatic emphasis areas will not propagate downstream potential short duration turbidity when cattle herded across Tompkins Creek..
Large Woody Debris	0	0	0	0	0	0	Livestock do not affect large woody debris loading
Pool Frequency and Quality	0	0	0	0	0	0	No change in flows or sediment delivery
Off-Channel Habitat	0	0	0	0	0	0	Off-channel habitat limited; none present in aquatic emphasis areas
Refugia	0	0	0	0	0	0	No change in ability of habitat to support and connect fish populations
Width/Depth Ratio	0	0	0	0	0	0	Streams within fish habitat too rocky to respond to grazing; effects within aquatic emphasis areas will not propagate downstream (USFS 2014b)
Streambank Condition	0	0	0	-/-	0	0	Streams within fish habitat too rocky to respond to grazing; effects within aquatic emphasis areas will not propagate downstream
Floodplain Connectivity	0	0	0	0	0	0	No change in flows or sediment delivery
Change in Peak/Base Flows	0	0	0	0	0	0	No diversions added/removed; ERA model remains below threshold. **See text for additional discussion**.
Increase in Drainage Network	0	0	0	0	0	0	No change in livestock use of roads or trails
Road Density and Location	0	0	0	0	0	0	No roads constructed or removed from the landscape
Disturbance History and Regime	0	0	0	-/-	0	0	USLE/GEO models not affected by grazing. ERA model changes unable to be discerned from background variability. (Table 8) (USFS 2014b)
Riparian Reserves	0	0	0	0	0	0	Condition and functionality of RR character will not be altered (USFS 2014b)

0 = Neutral effects
- = Insignificant or discountable negative effects
+ = Insignificant or discountable positive effects
S-= Significant negative effects
S+ = Significant positive effects
/ = Short-term/long-term effects

Alternative 3 – Current Management

Direct Effects and Indirect Effects

Under Alternative 3, livestock management as currently implemented would continue. Livestock utilization at its present level would occur upon Lake Mountain Allotment; and livestock would not be authorized for Middle Tompkins Allotment. Neither the redevelopment of Lookout Spring nor Faulkstein Camp Meadow exclosure construction would occur.

There would be no direct effects to fish or fish habitat.

Lake Mountain Allotment

Indirect effects as examined under Alternative 2 would continue at their present level for Lake Mountain Allotment only. Of the Indicators discussed, only "Chemical/Nutrients" apply for this alternative to this allotment and have the potential to affect fish habitat. In review, there may be insignificant effects by this Indicator to aquatic emphasis areas above fish habitat, but effects within fish occupied reaches will not be meaningfully detected.

Middle Tompkins Allotment

Middle Tompkins Allotment has not been grazed since 2007, and, therefore, the non-authorization of livestock would not alter the existing condition. Consequently, this Alternative will not result in any indirect effects to this allotment, beneficial or adverse. All Indicators discussed under Alternative 2 would retain their current status.

Cumulative Effects

There is potential for cumulative adverse impacts to fisheries resources from Alternative 3 for Lake Mountain Allotment only.

Lake Mountain Allotment

Alternative 3 would continue current management practices upon the Lake Mountain Allotment. Because current management is similar to Alternative 2 in respect to aquatic resource impacts, the cumulative effects discussion presented is also valid. In summary, there is some uncertainty of how livestock will respond to proposed treatments, so cumulative impact to anadromous salmonids, Forest Service Sensitive species, and Management Indicator Species cannot be definitively stated, but will likely be insignificant to undetectable.

Middle Tompkins Allotment

Middle Tompkins Allotment has not been grazed since 2007. Continuation of current management under Alternative 3 would maintain the vacant condition of the allotment. Consequently, this Alternative will not result in any indirect effects, unlike the Lake Mountain Allotment. Without direct or indirect effects within the footprint of future foreseeable actions, there cannot be cumulative effects.

Compliance with Law, Regulation, Policy, and the Forest Plan

The Alternative will meet Forest Plan Standards and Guides, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, Northwest Forest Plan, and all other relevant regulations, laws, and policies. Section 7 consultation will be completed with the National Marine Fisheries Service.

Summary of Effects

Of the elements comprising the Project, only livestock grazing has the potential to affect aquatic resources. There will be no direct effects. Potential indirect effects are either insignificant or will not be meaningfully detected within fish-occupied stream reaches. The effect of Alternative 1 (No Grazing) will be insignificantly positive. Alternative 2 (Proposed Action) and Alternative 3 (Current Management) both have insignificant negative effects, with the latter less so because impacts will be restricted to Lake Mountain Allotment. Insignificant to undetectable adverse cumulative effects may occur for both Alternative 2 and Alternative 3 due to the interaction of Westside Fire Recovery with the Project.

Therefore, the Fish Biologist has reached the following determination:

Table 9. Summary of findings for Threatened/Endangered species, Sensitive species, and Management Indicator Species.

Species	Special Status	[1,2]Determination (Alt 1)	[2]Determination (Alt 2, Alt 3)
Fishes			
Coho Salmon (and CH)	Federally Threatened	NLAA	NLAA
Chinook Salmon (Spring/Fall runs) (Upper Klamath-Trinity Rivers)	FSS	MANL	MANL
Steelhead Trout (Klamath Mountains Province)	FSS, MIS	MANL	MANL
Rainbow Trout	MIS	MANL	MANL
Pacific Lamprey	FSS	MANL	MANL
Klamath River Lamprey	FSS	MANL	MANL
Other Habitat			
Essential Fish Habitat (Coho/Chinook)		No effect	May adversely affect

[1]All Determination effects for Alternative 1 are either neutral or positive.

[2]Federally Listed Species
NA - Will not affect the species or its Critical Habitat
NLAA - May affect, not likely to adversely affect the species or its Critical Habitat
LAA - May affect, likely to adversely affect the species or its Critical Habitat
Forest Sensitive Species (FSS) / Management Indicator Species (MIS)
NE - No effect to the species (FSS and MIS)
MANL - May affect individuals, but is not likely to lead to a trend towards listing (FSS); and/or
May affect individuals, but is not likely to lead to a decreasing population trend (MIS)
MALT - May affect individuals, and is likely to result in a trend towards listing (FSS); and/or
May affect individuals, and is likely to lead to a decreasing population trend (MIS)

Table 10. Comparison of effects of alternatives for analysis Indicator.

Indicator	Alternative 1	Alternative 2	Alternative 3
Temperature	0	-/-	-/-
Turbidity	0	-/0	0
Chemical/Nutrients	+/+	-/-	-/- (less than Alt 2)
Substrate	0	-/0	0
Streambank Cond.	0	-/-	0
Dist. History/Regime	+/+	-/-	0
Peak/Base Flows	0	0	0

0 = Neutral effects
- = Insignificant or discountable negative effects
+ = Insignificant or discountable positive effects
S-= Significant negative effects
S+ = Significant positive effects
/ = Short-term/long-term effects

Literature Cited

Adams, M.J., Pearl, C.A., McCreary, B., Galvan, S.K., Wessell, S.J., Wente, W.H., Anderson, C.W., and A.B. Kuehl. 2009. Short-term effect of cattle exclosures on Columbia spotted frog (*Rana luteiventris*) populations and habitat in northeastern Oregon. *Journal of Herpetology* 43: 132-138.

Belchik, M., Hillemeir, D., and R. Pierce. 2004. The Klamath River fish kill of 2002; analysis of contributing factors. Prepared by the Yurok Tribe fisheries program, Klamath, CA. 42 p.

Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 *in* Influences of forest and rangeland management on salmonid fishes and their habitat (W.R. Meeham, ed.). American Fisheries Society Special Publication 19.

Buffington, J.M., Lisle, T.M., Woodsmith, R.D., and S. Hilton. 2002. Controls on the size and occurrence of pools in coarse-grained forest rivers. *River Research and Applications* 18: 507-531.

California Regional Water Quality Control Board (CRWQCB). 2014. Staff report for the 2012 integrated report for the Clean Water Act Section 305(b) Surface Water Quality Assessment and the 303(d) List of Impaired Waters – final report. North Coast Region, California Regional Water Quality Control Board, Santa Rosa, CA. 92 p.

DeWalle, D.R. 2008. Guidelines for vegetative shade restoration based upon a theoretical shaded-stream model. *Journal of the American Water Resources Association* 44: 1373-1387.

Drewry, J.J. 2006. Natural recovery of soil physical properties from treading damage of pastoral soils in New Zealand and Australia: a review. *Agriculture, Ecosystems, and Environment* 114: 159-169.

Greenwood, K.L., and B.M. McKenzie. 2001. Grazing effects on soil physical properties and the consequences for pastures: a review. *Australian Journal of Experimental Agriculture* 41: 1231-1250.

Hill, B.H., McCormick, F.H., Harvey, B.C., Johnson, S.L., Warren, M.L., and C.M. Elonen. 2010. Microbial enzyme activity, nutrient uptake and nutrient limitation in forested streams. *Freshwater Biology* 55: 1005-1019.

Laurie, G. 2012. Draft stream temperature monitoring on the Klamath National Forest, 2010 to 2011. Klamath National Forest, Yreka, CA. 17 p.

Meehan, W.R. (ed.). 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19.

Moore, R.D., D.L. Spittlehouse, and A. Story. 2005. Riparian microclimate and stream temperature response to forest harvesting: a review. *Journal of the American Water Resources Association* 41: 813-834.

Neary, D.G., K.C. Ryan, and L.F. DeBano, eds. 2005. (revised 2008). Wildland fire in ecosystems: effects of fire on soils and water. Gen. Tech. Rep. RMRS-GTR-42-vol. 4. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT. 250 p.

Parsons, A.J., J. Wainwright, R.E. Brazier, and D.M. Powell. 2006a. Is sediment delivery a fallacy? *Earth Surface Processes and Landforms* 31: 1325-1328.

Parsons, A.J., R.E. Brazier, J. Wainwright, and D.M. Powell. 2006b. Scale relationships in hillslope runoff and erosion. *Earth Surface Processes and Landforms* 31: 1384-1393.

Peterson, B.J., Wollheim, W.M., Mulholland, P.J., Webster, J.R., Meyer, J.L., Tank, J.L., Marto, E., Bowden, W.B., Valett, H.M., Hershey, A.E., McDowell, W.H., Dodds, W.K., Hamilton, S.K., Gregory, S., and D.D. Morrall. 2001. Control of nitrogen export from watersheds by headwater streams. *Science* 292: 86-90.

Platts, W.S. 1991. Livestock grazing. *in* Influences of forest and rangeland management on salmonid fishes and their habitats (Meehan, W.R., ed.). American Fisheries Society Special Publication 19:389-424.

Rhoades, C., Entwistle, D., and D. Butler. 2011. The influence of wildfire extent and severity on streamwater chemistry, sediment and temperature following the Hayman Fire, Colorado. *International Journal of Wildlife Fire* 20: 430-442.

Roche, L.M., Kromschroeder, L., Atwill, E.R., Dahlgren, R.A., and K.W. Tate. 2013. Water quality conditions associated with cattle and recreation on National Forest lands. *PloS One* 8: e68127. doi:10.1371/journal.pone.0068127 (14 p.)

Roche, L.M., Allen-Diaz, B., Eastburn, D.J., and K.W. Tate. 2012. Cattle grazing and Yosemite toad (*Bufo canorus* Camp) breeding habitat in Sierra Nevada meadows. *Rangeland Ecological Management* 65: 56-65.

Rosgen, D. 1996. Applied River Morphology. Printed Media Companies, Minneapolis, MN.

Royer, T.V., Prussian, A.M., and G.W. Minshall. 1999. Impact of suction dredging on water quality, benthic habitat, and biota in the Fortymile River and Resurrection Creek, Alaska. Prepared for Environmental Protection Agency, Region 10, Seattle, WA. 72 p.

Stocking, R.W. 2006. Distribution of *Ceratomyxa shasta* (Myxozoa) and habitat preference of the polychaete host, *Manayunkia speciosa*, in the Klamath River. MS Thesis. Oregon State University, Corvallis, Oregon. 131 p.

Stocking, R.W., and J.L. Bartholomew. 2004. Assessing links between water quality, river health, and *Ceratomyxosis* of salmonids in the Klamath River system. Department of Microbiology, Oregon State University, Corvallis, OR. 5 p.

Swanston, D.N. 1991. Natural processes. Pages 139-180 *in* Influences of forest and rangeland management on salmonid fishes and their habitat (W.R. Meeham, ed.). American Fisheries Society Special Publication 19.

Torgensen, C.E., and D.A. Close. 2004. Influence of habitat heterogeneity on the distribution of larval Pacific lamprey (*Lampetra tridentata*) at two spatial scales. *Freshwater Biology* 49: 614-630.

U.S. Environmental Protection Agency (EPA). 1993. Monitoring protocols to evaluate water quality effects of grazing management on western rangeland streams. EPA 910/R-93-017. U.S. Environmental Protection Agency, Surface Water Branch, Region 10, Seattle, WA. 179 p + appendices.

U.S. Fish and Wildlife Service (FWS). 2014. List/Proposed Threatened and Endangered Species for the Klamath National Forest (KLAMATH) Administrative Unit (Candidates Included). Accessed April 18, 2014. Document number: 131553747-10409 Available online: http://www.fws.gov/arcata/specieslist/

USDA Forest Service (USFS). 2014a. Hydrology Report – Lake Mountain and Middle Tompkins Grazing Allotment Management Plan Project. Klamath National Forest, Fort Jones, CA.

______. 2014b. Rangeland Specialist Report – Lake Mountain and Middle Tompkins Grazing Allotment Management Plan Project. Klamath National Forest, Fort Jones, CA.

______. 2014c. Happy Camp Complex geology hazards BAER report. Klamath National Forest, Yreka, CA. 16 p.

______. 2014d. Happy Camp Complex BAER report – funding request. Klamath National Forest, Yreka, CA. 17 p.

______. 2009. Westside Klamath National Forest MALAA Allotment Summary 1998-2008. Memo to file (March 26, 2009). Klamath National Forest, Yreka, CA. 3 p.

______. 2004. Biological Assessment/Evaluation for Threatened, Endangered, Proposed, Petitioned and Sensitive Species that may be affected by Facility Maintenance and Watershed Restoration. Klamath National Forest, Yreka, CA. 45 p + appendices.

______. 1995. Klamath National Forest Land and Resource Management Plan. Updated 2007 with Chapter 4 amendments. Klamath National Forest, Yreka, CA.

USDI, USDA, and NOAA. 2004. Analytical process for developing biological assessments for federal actions affecting fish within the Northwest Forest Plan area. November 2004. 17 pp. + appendices.

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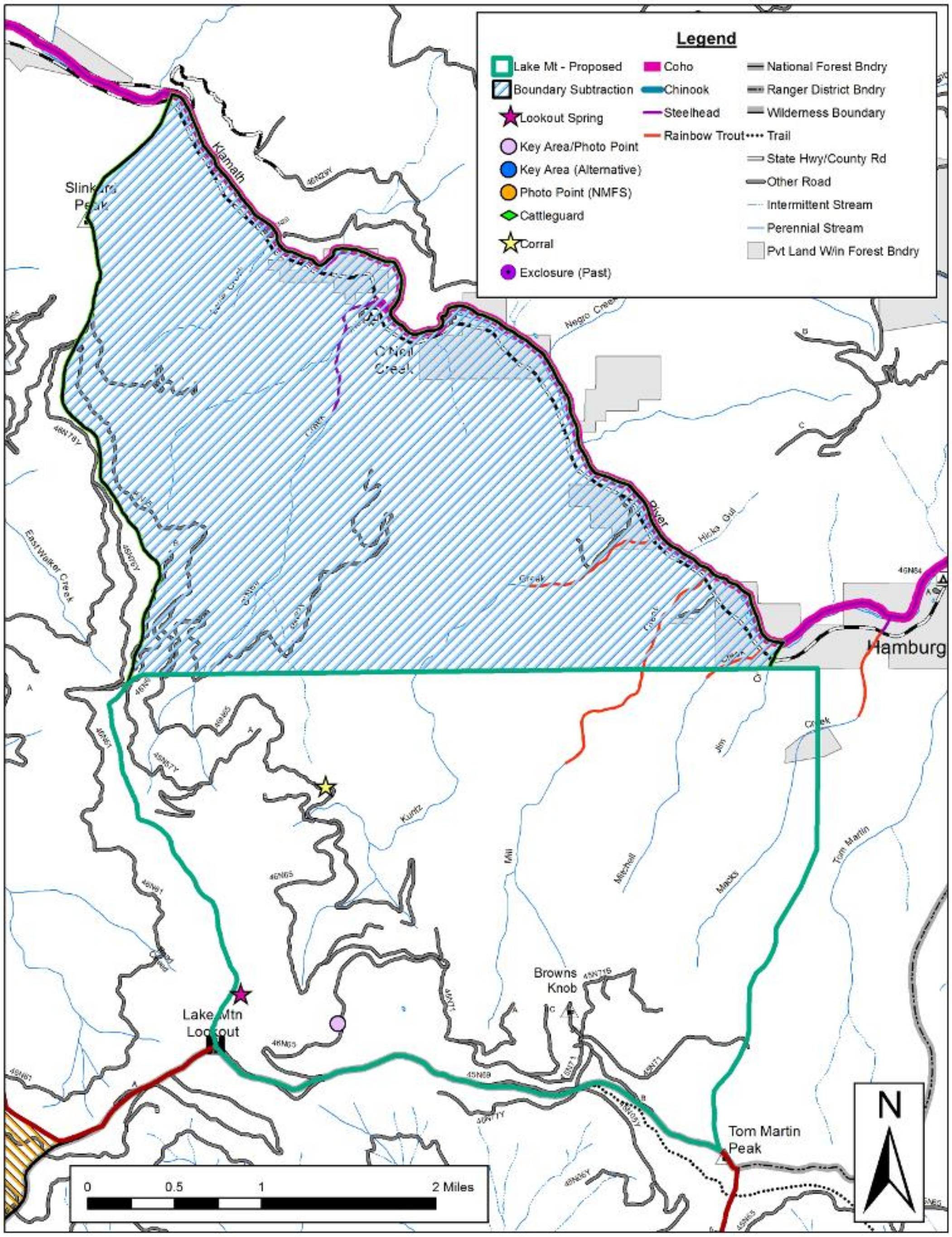
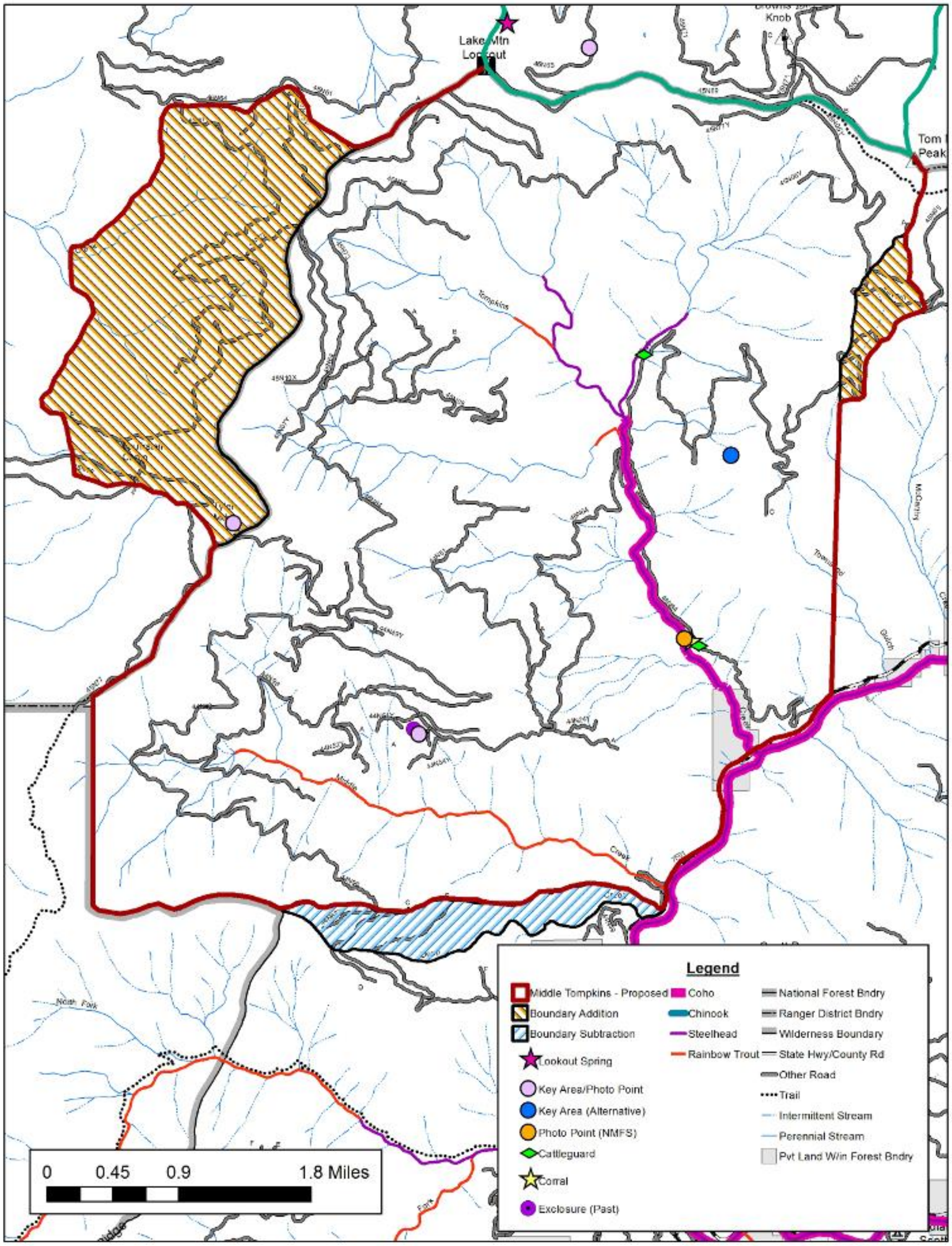
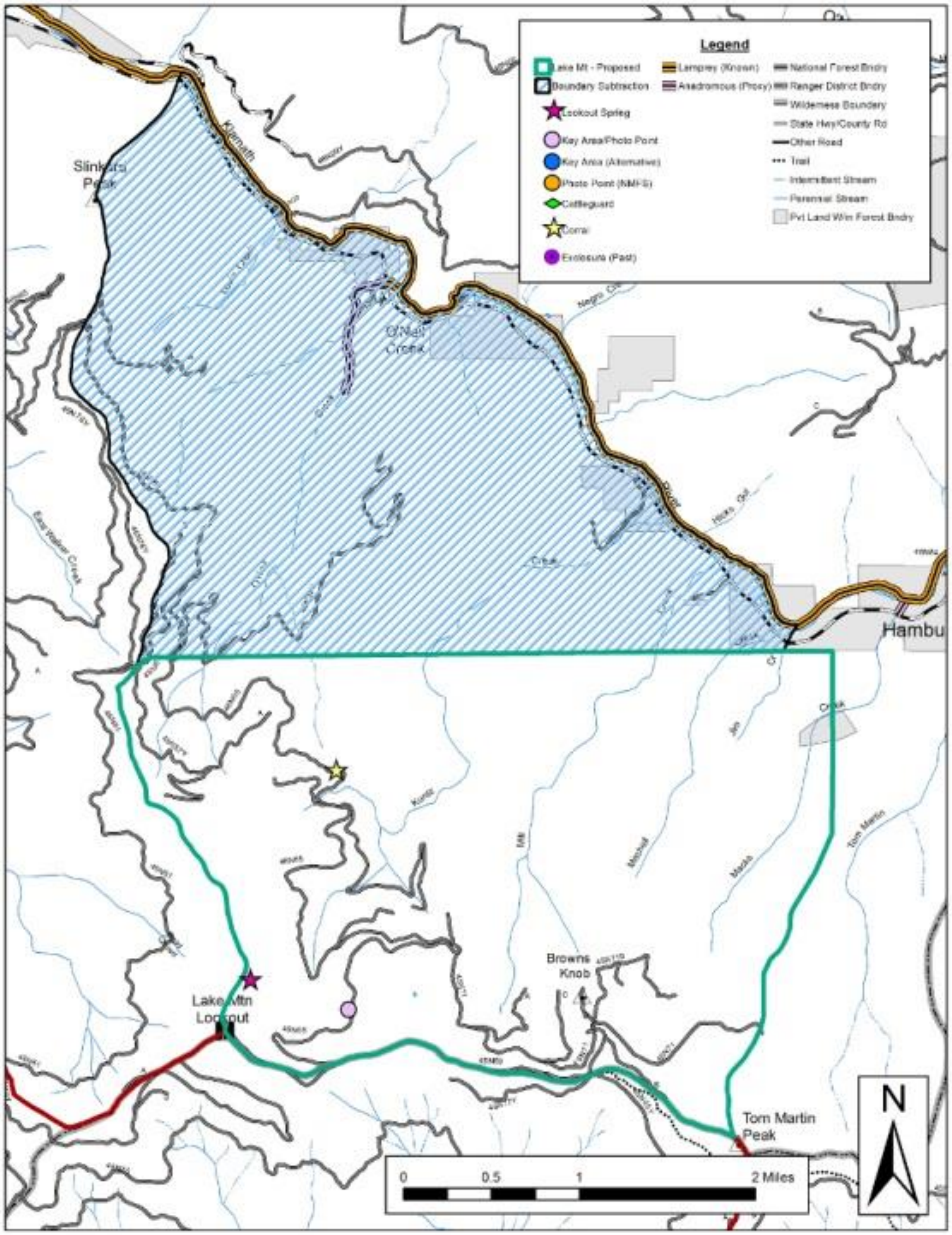
Maps and Figures



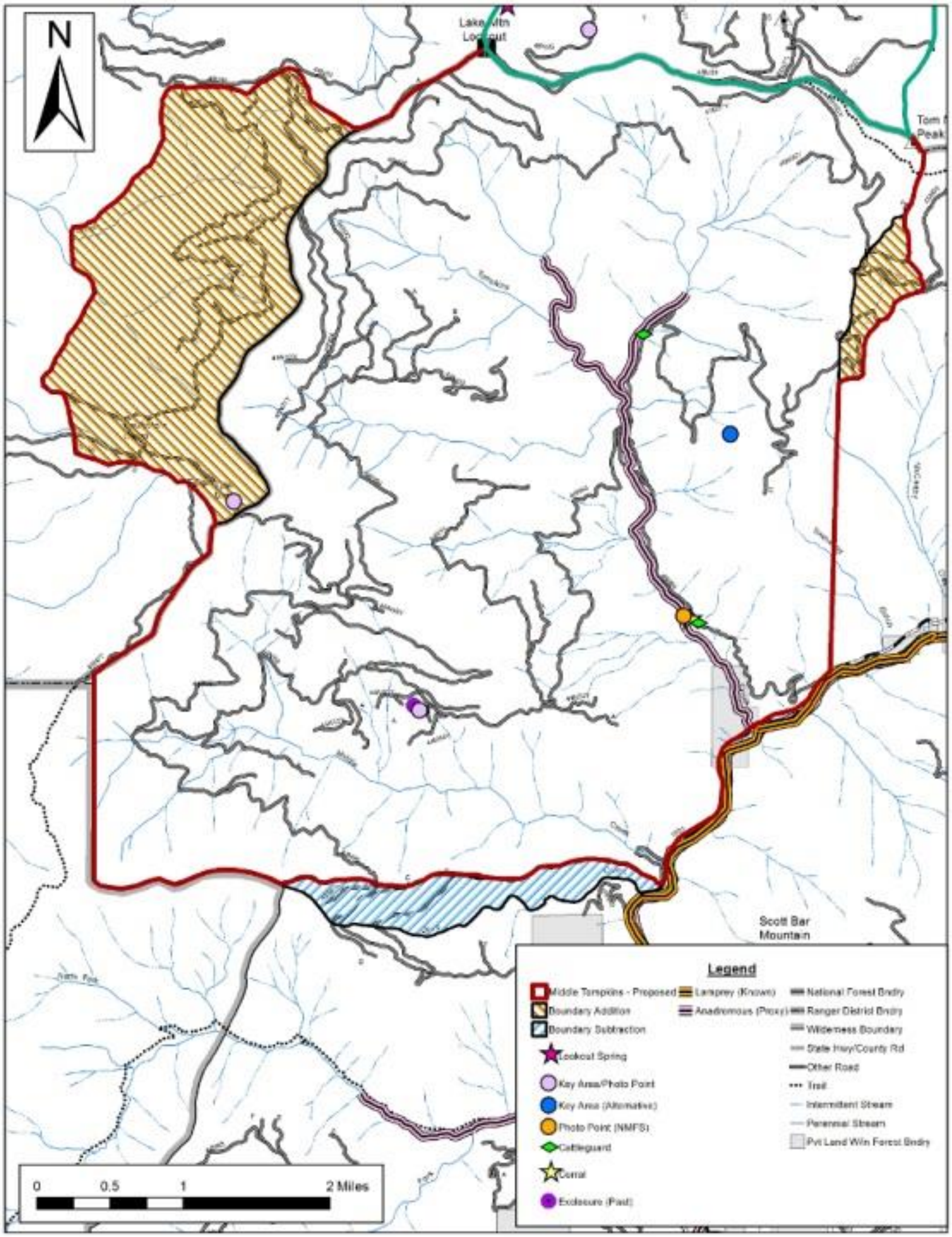
Map 1. Aquatic resources (salmonids) distribution within and nearby the Lake Mountain Allotment of the Lake Mountain/Middle Tompkins Project. Map includes proposed Project elements of boundary adjustment (crosshatched area excluded from Project), Lookout Spring, and monitoring locations.



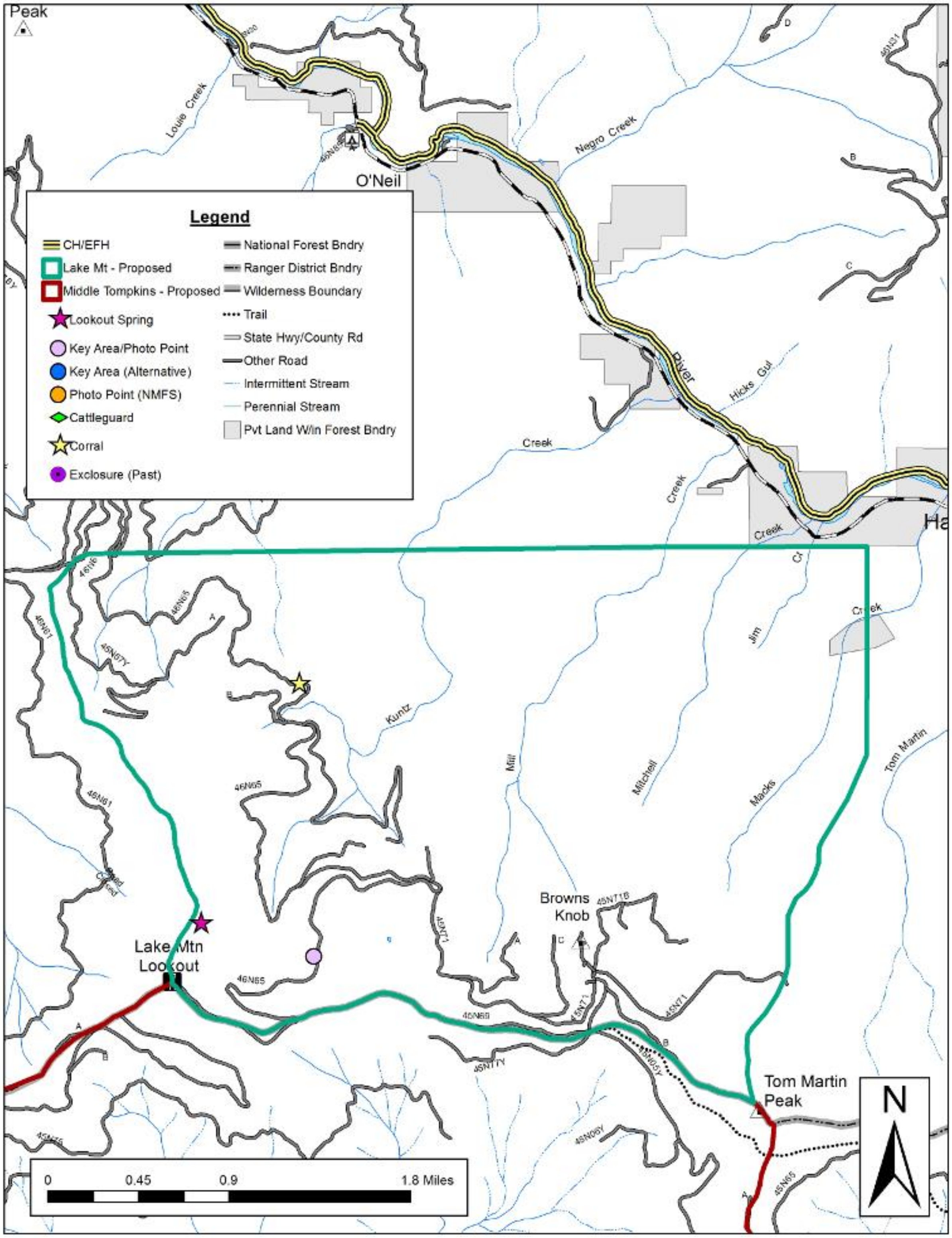
Map 2. Aquatic resources (salmonids) distribution within and nearby the Middle Tompkins Allotment of the Lake Mountain/Middle Tompkins Project. Map includes proposed Project elements of boundary adjustment (crosshatched area included or excluded from Project), monitoring locations, and other important locations or structures within the allotment.



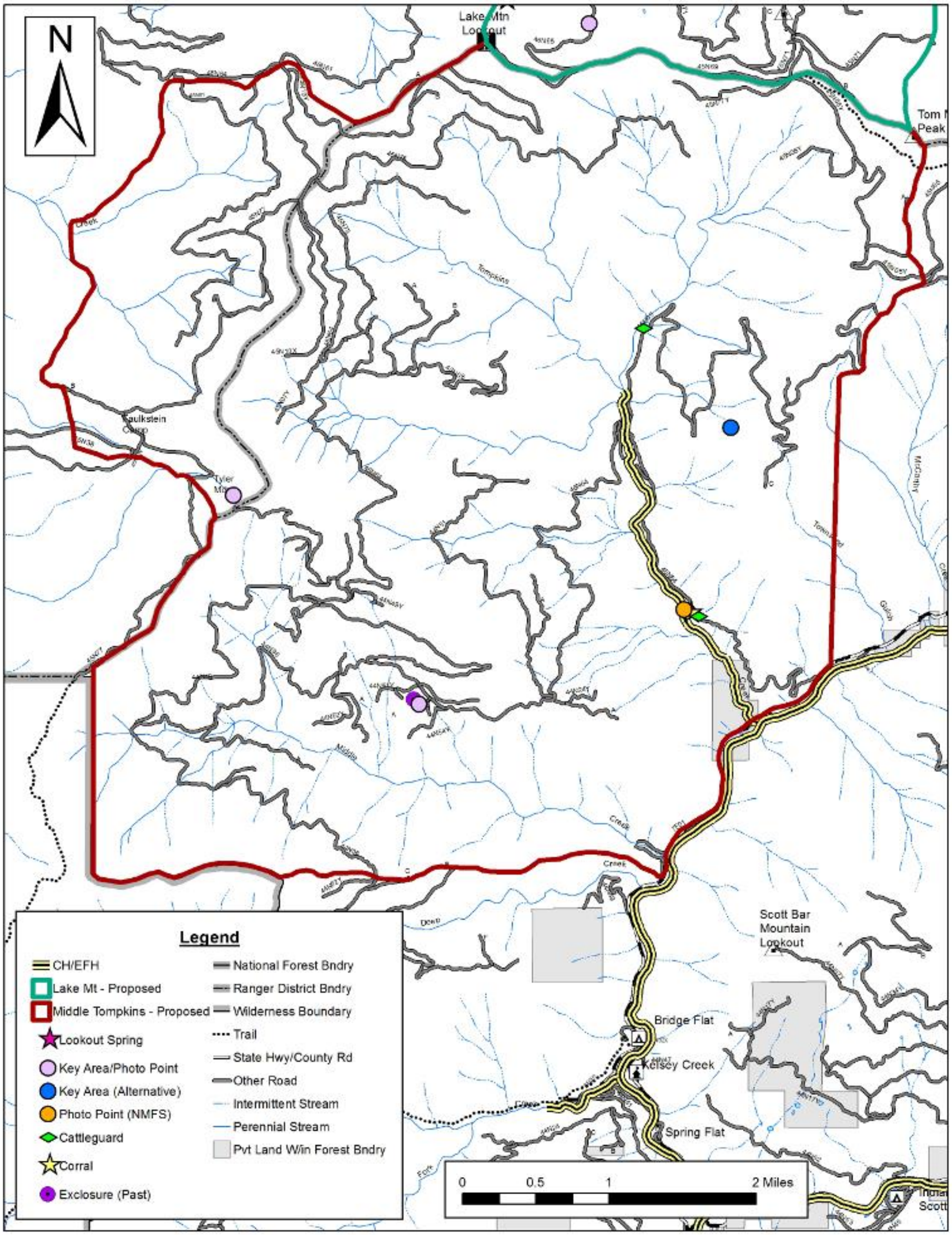
Map 3. Aquatic resources (non-salmonid) present within nearby the Lake Mountain Allotment of the Lake Mountain/Middle Tompkins Project. A modified "Anadromous" layer serves as a proxy for potential lamprey extent beyond known distributions. See Appendix B for additional discussion. Map includes proposed Project elements of boundary adjustment (crosshatched area excluded from Project), Lookout Spring, and monitoring locations.



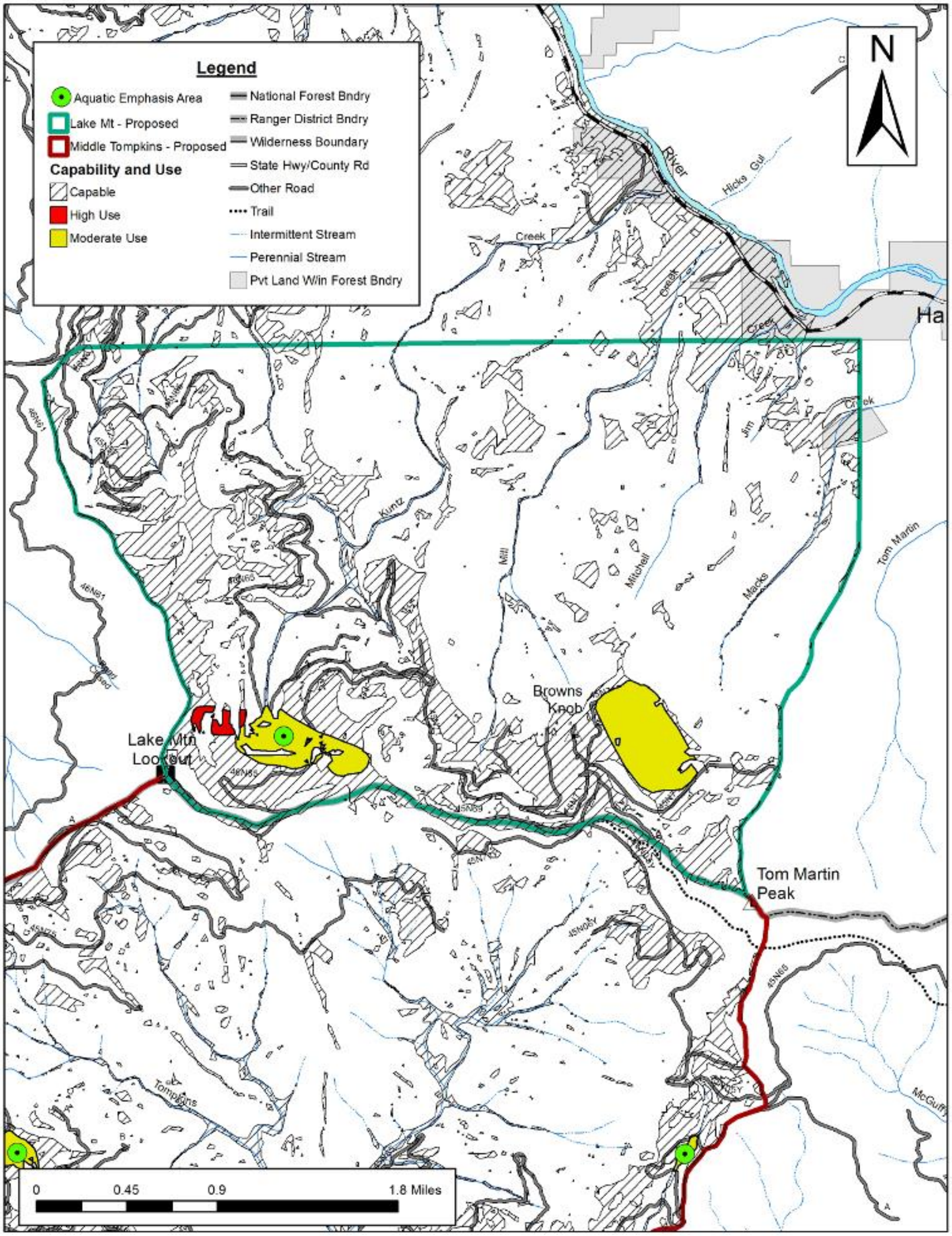
Map 4. Aquatic resources (non-salmonid) present within nearby the Middle Tompkins Allotment of the Lake Mountain/Middle Tompkins Project. A modified "Anadromous" layer serves as a proxy for potential lamprey extent beyond known distributions. See Appendix B for additional discussion. Map includes proposed Project elements of boundary adjustment (crosshatched area included or excluded from Project), monitoring locations, and other important locations or structures within the allotment..



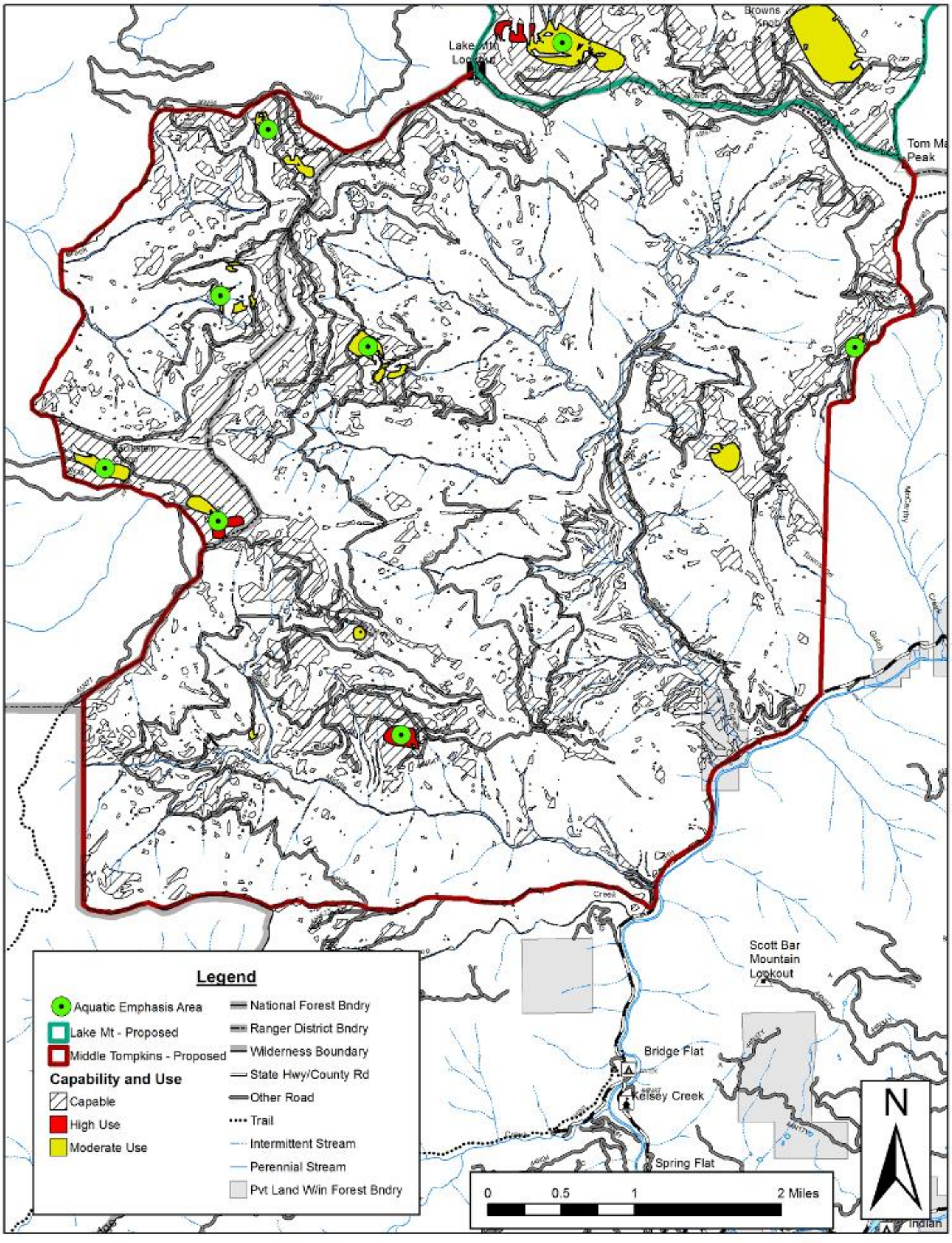
Map 5. Critical Habitat and Essential Fish Habitat extent for the Lake Mountain Allotment of the Lake Mountain/Middle Tompkins Project. See Appendix B for further discussion. Includes proposed Project elements of proposed boundary, monitoring locations, and other important locales/structures within the allotment.



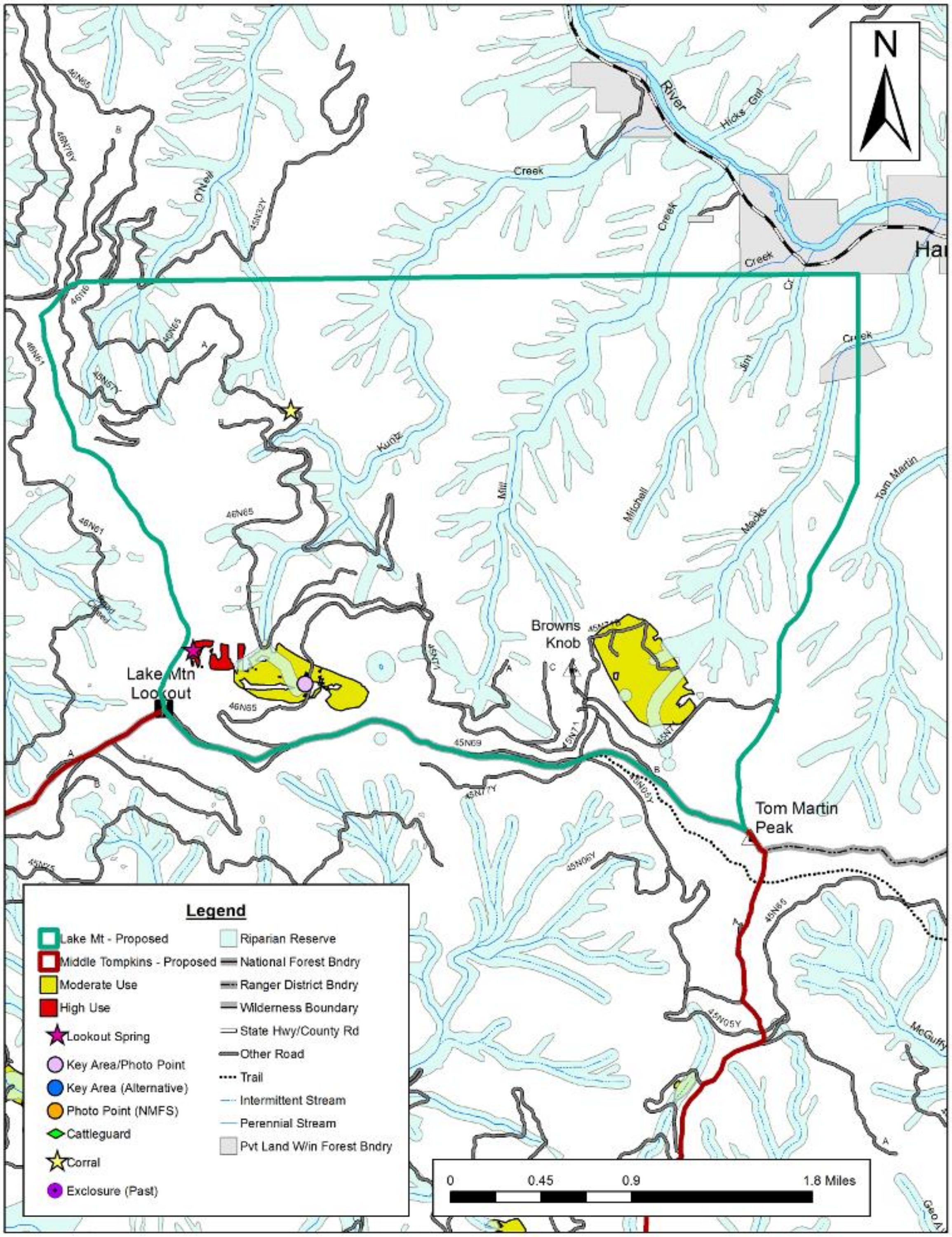
Map 6. Critical Habitat and Essential Fish Habitat extent for the Middle Tompkins Allotment of the Lake Mountain/Middle Tompkins Project. See Appendix B for further discussion. Includes proposed Project elements of proposed boundary, monitoring locations, and other important locales/structures within the allotment.



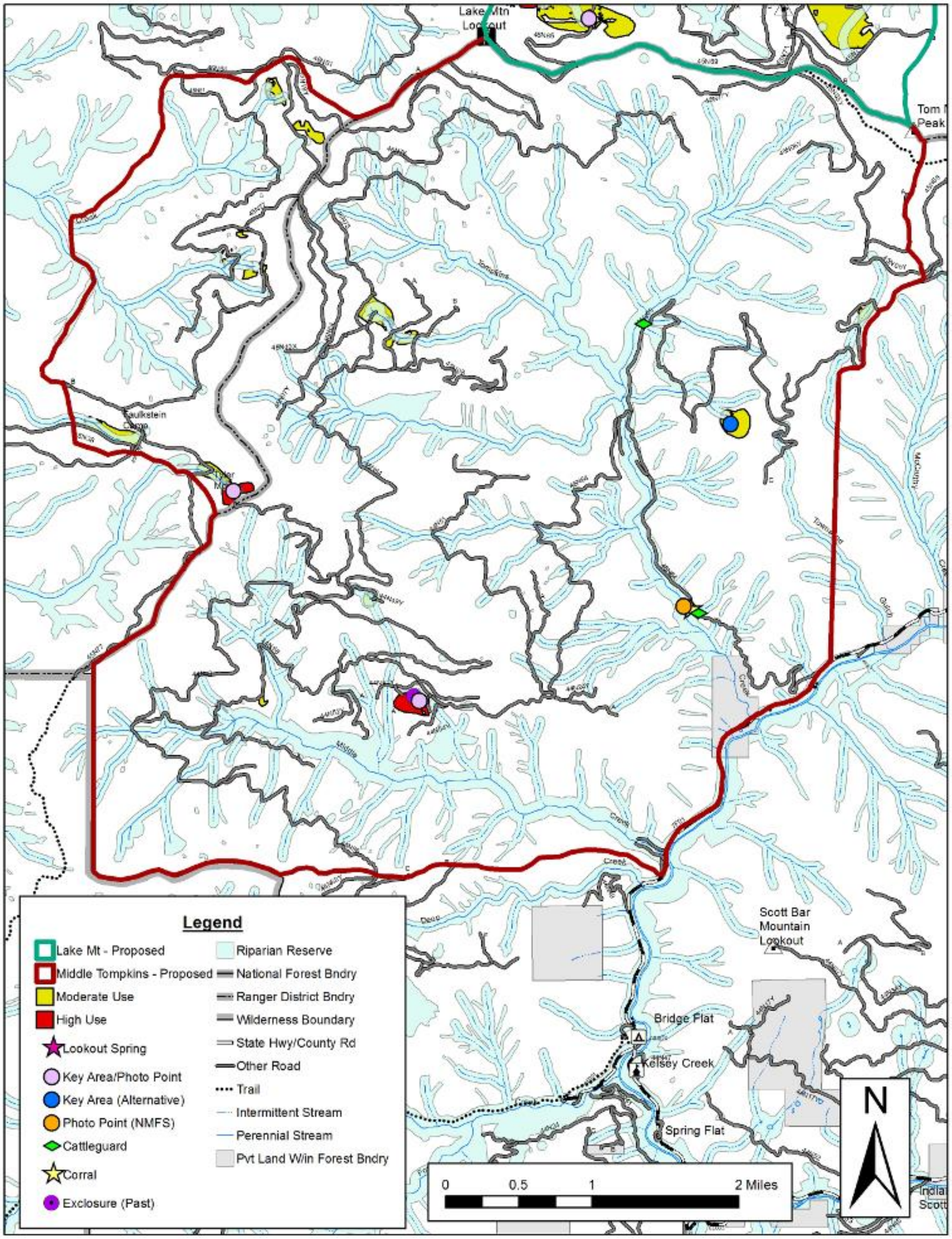
Map 7. Capability, including moderate and high concentrate use, and sites corresponding to aquatic emphasis areas for the Lake Mountain Allotment of the Lake Mountain/Middle Tompkins Project. Display is only within proposed allotment boundary.



Map 8. Capability, including moderate and high concentrate use, and sites corresponding to aquatic emphasis areas for the Middle Tompkins Allotment of the Lake Mountain/Middle Tompkins Project. Display is only within proposed allotment boundary.



Map 9. Riparian Reserves (hydrologic and geologic) and concentrated use areas for the Lake Mountain Allotment of the Lake Mountain/Middle Tompkins Project. Display is only within proposed allotment boundary.



Map 10. Riparian Reserves (hydrologic and geologic) and concentrated use areas for the Middle Tompkins Allotment of the Lake Mountain/Middle Tompkins Project. Display is only within proposed allotment boundary.

APPENDIX A: BRIEF DESCRIPTION OF CONCENTRATED USE AREAS

This appendix provides a brief description of each concentrated use area within the Lake Mountain Allotment and Middle Tompkins Allotment project area. Aquatic emphasis areas are discussed, as well as other locations. Most meadows, complexes, and concentrated use areas do not have formal place names. Except for Middle Meadow and Tyler Meadows, all names are as used by KNF range personnel and other staff.

Lake Mountain Allotment

Aquatic Emphasis Areas

Kuntz Meadow

Located at the headwaters of Kuntz Creek. Consists of dry to moist hillslope meadow with large inclusions of dense alder. Alder provides excellent streambank protection where it occurs, as does embedded rock. Hillslope gradient increases and the valley form narrows at the base of the meadow, creating a single stream channel. Stream is perennial. Distance to Coho Critical Habitat and anadromy (in Klamath River) is 4.0 miles, and 3.4 miles to resident rainbow trout.

Of particular interest within the Kuntz Meadow area is Lookout Spring. This spring area tends to exhibit higher use compared to the meadow due to proximity of both water and forage. There is no surface connection of the spring to Kuntz Creek – once water leaves the small pond associated with the spring, it soaks into hillslope soils.

Kuntz Meadow at established photo point (July 2013)

Small pond feature at Lookout Spring (August 2012)

Other Concentrated Use Areas

Browns Knob Complex

Located at the headwaters of Macks Creek. Consists of a broad area of plantations, vegetation manipulated via past logging activity, and natural openings. General hillslope gradient within the bowl is less than elsewhere in the vicinity. While small seeps and springs may be present, surface expression remains relatively near its source and there is no direct connection to Macks Creek.

Because the Browns Knob concentrated use area does not connect to fish habitat, it is not considered to be an aquatic emphasis area.

Middle Tompkins Allotment

Aquatic Emphasis Areas

Tompkins Meadow Complex

Located at the headwaters of an unnamed tributary to Tompkins Creek. Consists of a series of open areas and stringer meadows. Natural extent of open meadow area likely enhanced in the past due to activities relating to timber harvest access and landing use. Primary water feature is a drafting pond constructed upstream of an abandoned road crossing. Streambanks, particularly in steeper gradient areas, are well protected due to dense thickets of alder or willow. Willow form in meadow areas is good and shows little to no indication of past overutilization by livestock. Willow do show some current browse from large game species. Stream is perennial. Distance to Coho Critical Habitat (in Tompkins Creek) is 1.9 miles; and to anadromy is 1.1 miles, and resident rainbow trout is 0.8 miles.

Pond at Tompkins Meadow Complex (October 2012)

One of the small meadows within the Tompkins Meadow Complex (October 2012)

Alder cover downstream of pond (May 2014)

Faulkstein Camp Meadow

Located in the headwaters of Fish Creek. Elongated meadow area that appears to have additional historic impacts due to use as a skid and/or access trail for logging. A headcut is present midway through the meadow, although agent of origination is not apparent. Channel is actively adjusting throughout the meadow, with woody debris acting as local controls. Downstream of the meadow, gradient steepens and the channel is well stabilized by wood; and little to no vegetation characteristic of “riparian” (e.g., willow) is present. Stream is considered to be perennial, although short segments within the meadow itself may dry during baseflow conditions. Distance to Coho Critical Habitat and anadromy (in Grider Creek) is 2.5 miles, and to resident rainbow trout is 1.8 miles.

Meadow headcut (May 2014)

Stream channel downstream of meadow (May 2014)

Overview of Faulkstein Camp Meadow (May 2014)

Tyler Meadows

Located at the headwaters of an unnamed tributary to Grider Creek, often referred to as "Tyler Meadows Creek". Large natural hillslope meadow. Dense thickets of alder and willow common in the upper third of the meadow. Additional dense alder is present at the bottom of the meadow where the meadow gives way to forest and the gradient slightly increases, providing excellent protection to streambanks. Few game/livestock crossings through alder between meadow and road. A single small pond is present in the meadow. Streambanks not protected by alder/willow appear to be in good condition. Stream is perennial. Distance to Coho Critical Habitat and anadromy (in Grider Creek) is 2.7 miles, and resident rainbow trout is 2.0 miles.

Overview of Tyler Meadows. Note alder clumps at the top of the meadow (October 2012)

Thick alder protecting channel at the lower portion of the meadow (May 2014)

Middle Meadow

Located at the headwaters of an unnamed tributary to Middle Creek. Large natural meadow which has additional historic impacts from logging, use as a fire camp, and off-road vehicles. Meadow has a moist to dry character, with the dryer portions of the meadow currently exhibiting conifer encroachment. The wetter area on the meadow east side consolidates into a channel which generally dries, or is intermittent pools, by mid-summer. Willows are found within the meadow area as scattered individuals or small clumps. The remains of an exclosure is present on the east side of the meadow. Below Middle Meadow, channel gradient is steep and appears to be well stabilized by woody debris. Grasses are present where slope and moisture allows, but no riparian brush species.

Status of an aquatic emphasis area is marginal. The channel which drains the meadow is mapped as ephemeral. However, on the ground it is difficult to determine if channel downstream the meadow is truly ephemeral, or if the character leans intermittent. To address this uncertainty concerning connectivity, Middle Meadow is thus designated an aquatic emphasis area. Distance to Coho Critical Habitat and anadromy (in Scott River) is 2.3 miles, and resident rainbow trout is 0.4 miles.


Overview of Middle Meadow (April 2014)


Channel downstream of Middle Meadow (April 2014)

Rancheria Spring Complex
Located at the headwaters of Rancheria Creek and in the vicinity of Rancheria Spring. Multiple concentrated use areas, including dry hillslope in association with conifer plantations, as well as stringer meadows and steep hillslope spring/seep openings. Where forage areas are associated with springs/seeps, stream flow is *probably* perennial most years, although it may be a trickle during lowflow periods of summer and early fall. Distance to Coho Critical Habitat (in Grider Creek) is 4.5 miles, to anadromy is 4.0 miles, and to resident rainbow trout 3.4 miles.

Maple Spring Complex
Located at the headwaters of a tributary to Rancheria Creek and in the vicinity of Maple Spring. Multiple concentrated use areas, including dry hillslope in association with conifer plantations, as well as stringer meadows and steep hillslope spring/seep openings. Where forage areas are associated with springs/seeps, stream flow is *probably* perennial most years, although it may be a trickle during lowflow periods of summer and early fall. Distance to Coho Critical Habitat (in Grider Creek) is 4.0 miles, to anadromy is 3.5 miles, and to resident rainbow trout is 2.9 miles.

McCarthy Meadow Complex
Located at the headwaters of an unnamed tributary to McCarthy Creek. A linear complex of stringer meadows and hardwood clumps located between two bends of Forest Road 45N65. Stream flow is considered to be intermittent. A drafting sump – likely origination is from past timber-related activities – serves as watering access for livestock. The pond has been observed to be dry most year by mid- to late-summer. Distance to Coho Critical Habitat, anadromy, and resident rainbow trout (in Scott River) is 2.4 miles.

Other Concentrated Use Areas
Edie's Pond
Located at the headwaters of an unnamed tributary to Middle Creek. Edie's Pond is an artificial structure, constructed to provide wildlife habitat and access to water. Limited opportunities for forage around the pond due to shading by conifer forest, although some is present in association with the springhead, as well as nearby openings created during past timber harvest activities. Channel condition below the pond and lack of riparian vegetation such as willow suggests that

connectivity to Middle Creek is rare and restricted to short times during years of exceptional spring run-off conditions. Streamflow should be considered ephemeral, not intermittent as mapped.

Because the Edie's Pond concentrated use area does not connect regularly to fish habitat, it is not considered to be an aquatic emphasis area.

Edie's Pond (April 2014)

Channel below Edie's Pond (May 2014)

Townsend Meadow
Located at the headwaters of an unnamed tributary to Tompkins Creek on the ridgeline between Tompkins Creek and Townsend Gulch. Consists of a single opening in conifer forest. Natural extent of meadow area unknown as has likely been affected in the past due to activities related to timber harvest. Meadow is moist to dry in character with few willows or other riparian brush species. A small wet channel drains the southwest lobe of the meadow, but is very short in length before it goes subsurface and is not associated with any hillside drainage feature. The mapped drainage feature in the west lobe does not connect to the meadow, and is ephemeral in character, not intermittent. This feature lacks indications of annual scour, has upland species of brush and trees growing in it, and has been utilized in part as both skid trail and access road during past timber harvest.

Because the Townsend Meadow concentrated use area does not connect to fish habitat, it is not considered to be an aquatic emphasis area.

Overview of Townsend Meadow (April 2014)

Entirety of seep from Townsend Meadow – no associated hillside drainage feature (April 2014)

APPENDIX B: LIFE HISTORY AND BIOLOGICAL REQUIREMENTS OF PACIFIC SALMONIDS AND LAMPREY

Coho Salmon

General life history information and biological requirements of Southern Oregon/Northern California Coastal (SONCC) Coho salmon have been described in various documents (Hassler 1987; Sandercock 1991; Weitkamp, *et al*. 1995) as well as NOAA-Fisheries' final rule listing SONCC Coho salmon (May 6, 1997; 62 FR 24588).

Coho salmon enter the mainstem of the Klamath River for spawning typically in their third year, primarily between September and December, with a peak in October (NFMS 2007). Over most of this interval, mainstem flows below Iron Gate Dam often are high (ca. 2500-3000 cfs: NMFS 2001). Thus, standard methods for observing and counting spawning fish are not easily applied, and the size of the spawning population is unknown. Approximations put the entire ESU at about 10,000 spawning Coho salmon of non-hatchery origin per year (Weitkamp, *et al*. 1995), of which only a small portion is associated with the Klamath Basin, where several important tributary runs have been reduced to a handful of individuals (NMFS 2001, 2007). Although a minor amount of spawning and growth may occur in the mainstem, the mainstem serves adults primarily as a migration route (NFMS 2007).

Spawning occurs from November to January (Hassler 1987) in the tributaries to the Klamath River, but occasionally as late as February or March (Weitkamp, *et al*. 1995). Coho salmon eggs incubate for 35-50 days between November and March. Successful incubation depends on several factors including dissolved oxygen levels, temperature, substrate size, amount of fine sediment, and water velocity. Fry start emerging from the gravel two to three weeks after hatching and move into shallow areas with vegetative or other cover. As fry grow larger, they disperse up or downstream. In summer, Coho salmon fry prefer pools or other slower velocity areas such as alcoves, with woody debris or overhanging vegetation. Juvenile Coho salmon over-winter in slow water habitat with cover as well. Juveniles may rear in fresh water for up to 15 months then migrate to the ocean as smolts from March to June (Weitkamp, *et al.* 1995). Coho salmon adults typically spend two years in the ocean before returning to their natal streams to spawn as three-year olds.

Available historical and most recent published Coho salmon abundance information are summarized in the NOAA-Fisheries coast-wide status review (Weitkamp, *et al*. 1995). The rivers and tributaries in the California portion of this ESU were estimated to have average recent runs of 7,080 natural spawners and 17,156 hatchery returns, with 4,480 identified as native fish occurring in tributaries having little history of supplementation with non-native fish. However, limited information exists regarding Coho salmon abundance in the Klamath River basin. What information exists [CDFW unpublished data; U.S. Fish and Wildlife Service (USFWS) unpublished data] suggests adult populations are small to nonexistent in most years. The decline of SONCC Coho salmon across the ESU is not the result of one single factor, but rather a number of natural and anthropogenic factors that include dam construction, instream flow alterations; land use activities coupled with large flood events, fish harvest and hatchery effects.

Fish Creek – Coho Surveys

No surveys specifically targeting Coho been completed in Fish Creek. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with no Coho observed in Fish Creek (Kucas 1981). This stream is not considered to be suitable habitat for this species.

The District Fish Biologist visited Fish Creek in July 2013 to check for fish and examine general habitat condition. Fish Creek is within the range of Coho where it confluence with Grider Creek. However, a ~4 foot plunging falls immediately above the mouth prevents access at all but the highest flood flows (as evidenced by resident rainbow trout upstream). No suitable spawning or rearing habitat for Coho was observed.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Fish Creek

Unpublished data and/or field notes from: 2013.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Kuntz Creek – Coho Surveys

Coho have not been documented in Kuntz Creek. General habitat suitability is unknown, but the culvert under Highway 96 is a fish barrier (CDFW 2014a; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap material between culvert and Klamath River (less than 100 feet) is not suitable habitat. A presence/absence survey in 2005 did not observe Coho.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Kuntz Creek

Unpublished data and/or field notes from: 2005, 2013

California Department Fish and Wildlife (CDFW). 2014a. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

O'Neil Creek – Coho Surveys

Coho have been observed in O'Neil Creek. Snorkel surveys conducted by Forest Service or Karuk Tribe crew in 2002, 2003, 2005, and 2011 reported juvenile Coho. Fish surveys conducted in conjunction with habitat assessment in 2007 did not observe Coho. Prior to 2006, a culvert under Highway 96 limited Coho occupancy to about 500 feet of channel. Although the culvert has been replaced by a bridge, design deficiencies have continued to prevent fish passage (CDFS 2014). The bridge was scheduled to complete upgrades to address this issue (CalTrans 2013). A comprehensive review of datasets originating from multiple agencies/entities was conducted by

CDFW, with the conclusion that Coho presence in O'Neil Creek was substantiated (Garwood 2012).

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do include O'Neil Creek

Unpublished data and/or field notes from: 2002, 2003, 2005, 2007, 2011

California Department of Transportation (CalTrans). 2013. Coastal anadromous fish passage assessment and remediation progress report. Annual report to the legislature for annual year 2012. California Department of Transportation, Sacramento, CA. 12 pp.

California Department Fish and Wildlife (CDFW). 2014a. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

Garwood, J. 2012. Historic and recent occurrence of Coho salmon (*Onchorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionarily Significant Unit. Fisheries Branch Administrative Report, 2012-03. California Department Fish and Wildlife, Arcata, CA. 77 pp.

Macks Creek – Coho Surveys

No surveys targeting Coho been completed in Macks Creek – this stream is not considered to be suitable habitat for this species. Additionally, the culvert under Highway 96 (perched, >6 foot water freefall to pool) is a complete fish barrier (professional judgment).

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Macks Creek

Unpublished data and/or field notes from: 2013

Mill Creek – Coho Surveys

No surveys targeting Coho have been completed in Mill Creek. General habitat suitability is unknown, but the culvert under Highway 96 is a fish barrier (CDFW 2014a; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap and cobble alluvium material between culvert and Klamath River (less than 100 feet) is not suitable habitat.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Mill Creek

Unpublished data and/or field notes from: 2013

California Department Fish and Wildlife (CDFW). 2014a. California Department of Fish and

Game Passage Assessment Database. Query performed on 3/25/14.

Middle Creek – Coho Surveys

Coho have not been observed in Middle Creek. Multi-agency survey efforts specifically targeting spawning Coho occurred in the winters of 2001/02, 2002/03, and 2004/05, with neither redds nor fish observed (NCRC 2002, 2003; RCD 2005). Snorkel surveys conducted by Forest Service or contract crew in 1989, 1996, 1997, 1998, and 2005 did not report Coho, and nor did an ocular survey in 1980 (unpub. data; USFS 2006). A steep gradient at the confluence with Scott Creek, cumulating in a series of shallow bedrock chutes and a 4+ foot waterfall about 300 feet upstream from the mouth is considered to be a barrier to occupation. A comprehensive review of datasets originating from multiple agencies/entities was conducted by CDFW, with the conclusion that Coho presence in Middle Creek <u>was not</u> substantiated (Garwood 2012).

*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary
- No live/dead fish counts available
- Coho distribution maps do not include Middle Creek

Unpublished data and/or field notes from: 1989, 1996, 1997
U.S. Forest Service. 1998. Juvenile fish survey – Middle Creek. Unpub. data.
U.S. Forest Service. 1980. Stream survey – Middle Creek. Unpub. data.

Garwood, J. 2012. Historic and recent occurrence of Coho salmon (*Onchorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionarily Significant Unit. Fisheries Branch Administrative Report, 2012-03. California Department Fish and Wildlife, Arcata, CA. 77 pp.

Northern California Resource Center (NCRC). 2003. Scott River watershed adult Coho salmon spawning survey: December 2002 – January 2003. Report prepared by Northern California Resource Center for Siskiyou Resource Conservation Service (Etna, CA) and California Department of Fish and Game (Yreka, CA). 48 pp + appendices.

Northern California Resource Center (NCRC). 2002. Scott River watershed adult Coho salmon spawning survey: December 2001 – January 2002. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 30 pp + appendices.

Siskiyou Resource Conservation District (RCD). 2005. Scott River watershed adult Coho spawning ground surveys: November 2004 – January 2005. Report prepared by Siskiyou Resource Conservation District for U.S. Fish and Wildlife Service (Yreka, CA) [Agreement #113333J027] and California Department of Fish and Game (Yreka, CA) [Agreement #P0310331). 42 pp + appendices.

U.S. Forest Service. 2006. Habitat utilization by juvenile Coho salmon in selected tributaries of the Scott River, 2005. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 31 pp + appendices.

Rancheria Creek – Coho Surveys

This stream is not considered to be suitable habitat for this species. No surveys specifically targeting Coho been completed in Rancheria Creek. Surveys quantifying distribution of various fish species in the Grider Creek and its tributaries were conducted in 1981 and 1988, with no Coho observed in Rancheria Creek (Kucas 1981; Clearwater BioSciences 1988). A comprehensive review of datasets originating from multiple agencies/entities was conducted by CDFW, with the conclusion that Coho presence in Rancheria Creek <u>was not</u> substantiated (Garwood 2012).

The District Fish Biologist visited Rancheria Creek in July 2013 to check for fish and examine general habitat condition. Rancheria Creek is within the range of Coho where it confluences with Grider Creek. No suitable spawning for Coho was observed; and due to the higher gradient nature of the creek, juvenile rearing would be limited. Additionally, a bedrock chute near the mouth would also likely limit juvenile access. No Coho were observed during snorkeling.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Rancheria Creek

Unpublished data and/or field notes from: 2013

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Garwood, J. 2012. Historic and recent occurrence of Coho salmon (*Onchorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionarily Significant Unit. Fisheries Branch Administrative Report, 2012-03. California Department Fish and Wildlife, Arcata, CA. 77 pp.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Tompkins Creek – Coho Surveys

Coho have been observed in Tompkins Creek. Multi-agency survey efforts specifically targeting spawning Coho occurred in the winters of 2001/02, 2002/03, and 2004/05 (NCRC 2002, 2003; RCD 2005; USFS 2006). Other Coho spawning surveys occurred in 2006/07, 2009/10, 2010/11, and 2011/12 with redds reported in 2009/10 (RCD 2010, Knechtle and Chesney 2012). Dive surveys conducted by Forest Service or contracted personnel in 1989 and 2005 encountered Coho juveniles. The upstream extent of Coho is not well defined, but is believed to be near the Road 46N64 bridge crossing of Tompkins Creek, upstream of which discharge and steep gradients are presumed to inhibit upward movement of fish, a total distance of about 2.8 miles. In 2005, a possible barrier to upward movement of Coho was reported at about 1.5 miles (USFS 2006). A comprehensive review of datasets originating from multiple agencies/entities was conducted by

CDFW, with the conclusion that Coho presence in Tompkins Creek was substantiated (Garwood 2012).

*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary
- No live/dead fish counts available
- Coho distribution maps do include Tompkins Creek

Redd Count

- CalFish records available (1): 91423
    - Inclusive years (all datasets): 2001/2002, 2002/2003
- Summary: No redds recorded

Unpublished data and/or field notes from: 1989, 2006

Garwood, J. 2012. Historic and recent occurrence of Coho salmon (*Onchorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionarily Significant Unit. Fisheries Branch Administrative Report, 2012-03. California Department Fish and Wildlife, Arcata, CA. 77 pp.

Knechtle, M., and D. Chesney. 2012. 2011 Scott River salmon studies final report. California Department Fish and Wildlife, Northern Region, Yreka, CA. 21 p.

Northern California Resource Center (NCRC). 2003. Scott River watershed adult Coho salmon spawning survey: December 2002 – January 2003. Report prepared by Northern California Resource Center for Siskiyou Resource Conservation Service (Etna, CA) and California Department of Fish and Game (Yreka, CA). 48 pp + appendices.

Northern California Resource Center (NCRC). 2002. Scott River watershed adult Coho salmon spawning survey: December 2001 – January 2002. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 30 pp + appendices.

Siskiyou Resource Conservation District (RCD). 2010. Unpubl. map – Scott River Coho surveys, Coho redds, 2010.

Siskiyou Resource Conservation District (RCD). 2005. Scott River watershed adult Coho spawning ground surveys: November 2004 – January 2005. Report prepared by Siskiyou Resource Conservation District for U.S. Fish and Wildlife Service (Yreka, CA) [Agreement #113333J027] and California Department of Fish and Game (Yreka, CA) [Agreement #P0310331). 42 pp + appendices.

U.S. Forest Service. 2006. Habitat utilization by juvenile Coho salmon in selected tributaries of the Scott River, 2005. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 31 pp + appendices.

Tyler Meadow Creek – Coho Surveys

No surveys specifically targeting Coho been completed in Tyler Meadow Creek. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with no Coho observed in Tyler Meadow Creek (Kucas 1981). This stream is not considered to be suitable habitat for this species.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do not include Tyler Meadow Creek

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Scott River – Coho Surveys

Coho are present in the Scott River in the general project area, with a focus on the reach between Scott Bar and Middle Creek. Specifics concerning suitability of the river in this location for spawning is poorly known due to often hazardous discharge conditions which are present in winter. However, the rotary screw trap operated by the CDFW annually records downmigrating smolts in the spring (Daniels, *et al*. 2011); and the video weir upstream of Indian Scotty Campground captures at least part of the spawning run in the late-fall/early-winter (Knechtle and Chesney 2014).

*Location restricted, where possible, to general Project area (Scott Bar to Middle Creek)
*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary
- Coho distribution maps include the Scott River in the Project area

Live/Dead Fish Count

- CalFish records available (1): 90359
  - Inclusive years (all datasets): 1992-1997
- Summary: Coho recorded 1993-1996
- Note: specific locations not provided, but often mouth to Fort Jones

Redd Count

- CalFish records available (1): 91419
  - Inclusive years (all datasets): 2002-2012
- Summary: Redds recorded 2008, 2009
- Note: specific locations not provided, but likely similar reaches as Fall Chinook spawning surveys; high flows may make comprehensive surveys difficult

Other – Weir Operations (near mouth)

- CalFish records available (2): 90418, 90419
  - Inclusive years (all datasets): 1983-1991
- Summary: Coho recorded all years

Daniels, S., Debrick, A., Diviney, C., Underwood, K., Stenhouse, S., and W. Chesney. 2011. Final report Shasta and Scott River juvenile salmonid outmigrant study, 2010. Report #P071307. California Department of Fish and Game, Northern Region, Yreka, CA. 97 p.

Knechtle, M., and D. Chesney. 2014. 2013 Scott River salmon studies final report. California Department Fish and Wildlife, Northern Region, Yreka, CA. 23 p.

Grider Creek – Coho Surveys

Coho have been observed in Grider Creek. Large-scale fish distribution surveys of the Grider Creek drainage, including its tributaries, were first conducted in 1981 (Kucas 1981), and again in 1988 (Clearwater BioSciences 1988). Coho juveniles were found during both surveys. More recently, fish surveys reporting upon juveniles were conducted in most years 2002 through 2013. While some of the surveys specifically targeted Coho, fish were also incidentally reported during Spring Chinook/Summer Steelhead, Fall Chinook, and other surveys. Specifics concerning use of the creek for spawning is poorly known due to often hazardous discharge conditions which are present in winter, as well as snow creating access difficulties. Spawning surveys completed in 2008/2009 found nothing (Corum 2010). The upstream extent of Coho was originally believed to be an 8 foot waterfall barrier upstream of the Rancheria Creek (Kucas 1981; Clearwater BioSciences 1988), but Coho have since been found above. A comprehensive review of datasets originating from multiple agencies/entities was conducted by CDFW, with the conclusion that Coho presence in Grider Creek was substantiated (Garwood 2012).

*CalFish query performed on 3/25/2014

- No redd counts available
- See project record for expanded datasets referred in summary
- Coho distribution maps include Grider Creek

Live/Dead Fish Count

- CalFish records available (1): 91565
    - Inclusive years (all datasets): 2001-2003
- Summary: Carcasses (adult) and/or juveniles noted

Unpublished data and/or field notes from: 2002-2013

Corum, A. 2010. Draft middle Klamath tributary Coho spawning survey report – 2007/2008. Report prepared for U.S. Department of the Interior, Bureau of Reclamation by A. Corum, Karuk Tribe. 6 pp.

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Garwood, J. 2012. Historic and recent occurrence of Coho salmon (*Onchorhynchus kisutch*) in California streams within the Southern Oregon/Northern California Evolutionarily Significant Unit. Fisheries Branch Administrative Report, 2012-03. California Department Fish and Wildlife, Arcata, CA. 77 pp.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Klamath River – Coho Surveys

Coho are present in the Klamath River in the general project area, with a focus on the reach in the vicinity of Hamburg. Specifics concerning suitability of the river in this location for spawning is poorly known due to often hazardous discharge conditions which are present in winter. However, surveys for Coho juveniles during the summer do find utilization at tributary confluences and thermal refugia (Sutton and Soto 2010).

*Location restricted to general Project area (Hamburg vicinity)
*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Coho distribution maps do include Klamath River

Unpublished data and/or field notes from: 2002-2013

Sutton, R., and T. Soto. 2010. Juvenile Coho salmon behavioral characteristics in Klamath River summer thermal refugia. *River Research and Applications* 28: 338-346.

Chinook Salmon

The following information was excerpted or summarized from NMFS status review of Chinook salmon (Meyers, *et al.* 1998). Chinook salmon mature between 2 and 6+ years of age (Meyers, *et al.* 1998). Fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas on the mainstem or lower tributaries of the rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991). Incubation temperature for eggs is 5.0 to 14.4°C, with below 13.0°C preferred for optimal development in most stocks (McCullough 1999). Emerging fry generally do not develop normally above 12.8°C (McCullough 1999). Post-emergent fry seek out shallow, nearshore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. Once feeding, the optimal growth range for juveniles is 10.0 to 15.6°C, with fingerlings preferring to hold at 12 to 14°C (McCullough 1999). In preparation for their entry into a saline environment, juvenile salmon undergo physiological transformations known as smoltification that adapt them for their transition to salt water. For Chinook salmon, the recommended maximum temperature to maintain migratory response and seaward adaptation is 12.0°C; and at temperatures greater than 13.0°C, some physiological processes of smolting may be delayed, and, in extreme cases, reversed (McCullough 1999). Chinook salmon spend between one and four years in the ocean before returning to their natal streams to spawn (Meyers, *et al*. 1998). Chinook salmon addressed in this document exhibit an ocean-type life history, and smolts out-migrate predominantly as subyearlings, generally during April through July. Chinook salmon spend between 2 and 5 years in the ocean (Healey 1991), before returning to freshwater to spawn. Some Chinook salmon return from the ocean to spawn one or more years before full-sized adults return.

The UKT ESU includes fall- and spring-run Chinook salmon in the Klamath and Trinity River Basin upstream of the confluence of the Klamath and Trinity rivers. Historically, spring-run Chinook salmon were probably the predominate run. This ESU still retains several distinct spring-run populations, albeit at much reduced abundance levels. Fish from this ESU exhibit an ocean-type life history; however genetically and physically, these fish are quite distinct from coastal and Central Valley Chinook salmon ESUs. Genetic analysis indicated that this ESU form a unique group that is quite distinctive compared to neighboring ESUs. The majority of spring- and fall-run fish emigrate to the marine environment primarily as subyearlings, but have a significant proportion of yearling smolts. Recoveries of coded wire tags indicate that both runs have a coastal distribution off the California and Oregon coasts. The 2013 fall-run Chinook salmon run into the Klamath River system, as compiled by CDFW, was estimated to be 179,541 fish (165,125 adult and 14,416 grilse) (CDFW 2014b). Of the 69,986 basin-wide natural spawners (i.e., not of hatchery origin), 2,480 were from the Salmon River and 4,624 from the Scott River. The Klamath River run in 2014 was projected to be above recent historical average (KRTT 2014).

Fish Creek – Chinook Surveys

No surveys specifically targeting Chinook been completed in Fish Creek. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with no Chinook observed in Fish Creek (Kucas 1981). Additionally, Fish Creek is about 2.4 miles upstream on Grider Creek from the barrier which is considered to be the upstream limit of Chinook in the system. Therefore, this stream is not considered to be suitable habitat for this species.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Fish Creek

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Kuntz Creek – Chinook Surveys

Coho have not been documented in Kuntz Creek. General habitat suitability is unknown, but the culvert under Highway 96 is a fish barrier (CDFW 2014a; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap material between culvert and Klamath River (less than 100 feet) is not suitable habitat. A presence/absence survey in 2005 did not observe Chinook.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Kuntz Creek

Unpublished data and/or field notes from: 2005, 2013

California Department Fish and Wildlife (CDFW). 2014a. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

O'Neil Creek – Chinook Surveys

Chinook have been observed in O'Neil Creek. Snorkel surveys for juvenile fish conducted by Forest Service or Karuk Tribe crew in 2003 and 2005 reported juvenile Chinook. Similar surveys in 2002 and 2011 did not see Chinook; and nor did fish surveys conducted in conjunction with habitat assessment in 2007. Prior to 2006, a culvert under Highway 96 limited Coho occupancy to about 500 feet of channel. Although the culvert has been replaced by a bridge, design deficiencies have continued to prevent fish passage (CDFS 2014). The bridge was scheduled to complete upgrades to address this issue (CalTrans 2013).

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include O'Neil Creek

Unpublished data and/or field notes from: 2002, 2003, 2005, 2007, 2011

California Department of Transportation (CalTrans). 2013. Coastal anadromous fish passage assessment and remediation progress report. Annual report to the legislature for annual year 2012. California Department of Transportation, Sacramento, CA. 12 pp.

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

Macks Creek – Chinook Surveys

No surveys targeting Chinook been completed in Macks Creek – this stream is not considered to be suitable habitat for this species. Additionally, the culvert under Highway 96 (perched, >6 foot water freefall to pool)is a complete fish barrier (professional judgment).

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Macks Creek

Unpublished data and/or field notes from: 2013

Mill Creek – Chinook Surveys

No surveys targeting Chinook have been completed in Mill Creek. General habitat suitability is unknown, but the culvert under Highway 96 is a fish barrier (CDFW 2014a; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap and cobble alluvium material between culvert and Klamath River (less than 100 feet) is not suitable habitat.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Mill Creek

Unpublished data and/or field notes from: 2013

California Department Fish and Wildlife (CDFW). 2014a. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

Middle Creek – Chinook Surveys

Chinook have not been observed in Middle Creek. Snorkel surveys conducted by Forest Service or contract crew in 1989, 1996, 1997, 1998, and 2005 did not report Chinook, and nor did an ocular survey in 1980. A steep gradient at the confluence with Scott Creek, cumulating in a series of shallow bedrock chutes and a 4+ foot waterfall about 300 feet upstream from the mouth is considered to be a barrier to occupation.

*CalFish query performed on 3/25/2014

- No live/dead fish nor read counts available
- Chinook distribution maps do not include Middle Creek

Unpublished data and/or field notes from: 1989, 1996, 1997

U.S. Forest Service. 1998. Juvenile fish survey – Middle Creek. Unpub. data.
U.S. Forest Service. 1980. Stream survey – Middle Creek. Unpub. data.

U.S. Forest Service. 2006. Habitat utilization by juvenile Coho salmon in selected tributaries of the Scott River, 2005. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 31 pp + appendices.

Rancheria Creek – Chinook Surveys

No surveys specifically targeting Chinook been completed in Rancheria Creek. Surveys quantifying distribution of various fish species in the Grider Creek and its tributaries were conducted in 1981 and 1988, with no Chinook observed in Rancheria Creek (Kucas 1981; Clearwater BioSciences 1988). This stream is not considered to be suitable habitat for this species.

The District Fish Biologist visited Rancheria Creek in July 2013 to check for fish and examine general habitat condition. Rancheria Creek is within the range of Chinook where it confluences with Grider Creek. No suitable spawning for Chinook was observed; and due to the higher gradient nature of the creek, juvenile rearing would be limited. Additionally, a bedrock chute near the mouth would also likely limit juvenile access. No Chinook were observed during snorkeling.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Rancheria Creek

Unpublished data and/or field notes from: 2013

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Tompkins Creek – Chinook Surveys

Chinook have not been observed in Tompkins Creek. Spawning surveys have been conducted in 1996, 2010, 2012, and 2013, but neither fish nor redds have been found. Additionally, numerous surveys targeting rearing Coho or steelhead/rainbow trout have occurred (see respective sections), yet no juvenile Chinook have ever been seen. It is unclear why Chinook do not use Tompkins Creek, but the mouth may not support sufficient discharge in the fall for this species to successfully enter the system. Additionally, while spawning substrate suitable for Chinook may be available, it tends to be patchy; and the small size of the creek relative to the size of an adult fish, along with a general lack of deep pools, creates high vulnerability to spawners to predators.

*CalFish query performed on 3/25/2014
- No live/dead fish or redd counts available
- Chinook distribution maps do not include Tompkins Creek

Unpublished data and/or field notes from: 1996, 1996, 1997, 2010, 2012, 2013

Tyler Meadow Creek – Chinook Surveys

No surveys specifically targeting Chinook been completed in Tyler Meadow Creek. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with no Chinook observed in Tyler Meadow Creek (Kucas 1981). This stream is not considered to be suitable habitat for this species.

*CalFish query performed on 3/25/2014
- No live/dead fish nor redd counts available
- Chinook distribution maps do not include Tyler Meadow Creek

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Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Scott River – Chinook Surveys

Chinook are present in the Scott River in the general project area, with a focus on the reach between Scott Bar and Middle Creek. Although individual agencies may have been conducting fish and/or redd surveys upon the Scott River for decades, cooperative multi-entity fall Chinook spawning surveys have occurred annually since 1992 (most recent reports: Meneks 2014 [USFS] and Knechtle and Chesney 2014 [CDFW]). Additionally, the rotary screw trap operated by the CDFW annually records downmigrating smolts in the spring (Daniels, *et al*. 2011); and the video weir upstream of Indian Scotty Campground captures the portion of the fall spawning run destined for the Scott River Valley and upper canyon area (Knechtle and Chesney 2013). Finally, dive investigations into the presence/absence of spring Chinook occurred 2007 through 2009, with one adult Chinook seen in 2008 within the deep pools of the Scott River adjacent the Project area (QVIR 2010).

*Location restricted, where possible, to general Project area (Scott Bar to Middle Creek)
*CalFish query performed on 1/30/2013
- See project record for expanded datasets referred in summary
- Chinook distribution maps include the Scott River in the Project area

Live/Dead Fish Count
- CalFish records available (1): 90361
  - Inclusive years (all datasets): 1983-1986, 1992-1997
- Summary: Chinook recorded all years
- Note: specific locations not provided, but often mouth to Fort Jones

Redd Count
- CalFish records available (2): 90716, 91006

- Inclusive years (all datasets): 1964-1972, 1974-1978, 1988, 1989, 1991-1997
- Summary: Redds recorded all years
- Note: specific locations not provided, but often “entire mainstem”

Other – Weir Operations (near mouth)

- CalFish records available (2): 90406, 90407
  - Inclusive years (all datasets): 1983-1991
- Summary: Chinook recorded all years

Other – Population Estimates

- CalFish records available (2): 90673, 90700
  - Inclusive years (all datasets): 1968, 1978-2013
- Summary: Chinook recorded all years

Daniels, S., Debrick, A., Diviney, C., Underwood, K., Stenhouse, S., and W. Chesney. 2011. Final report Shasta and Scott River juvenile salmonid outmigrant study, 2010. Report #P071307. California Department of Fish and Game, Northern Region, Yreka, CA. 97 p.

Knechtle, M., and D. Chesney. 2014. 2013 Scott River salmon studies final report. California Department Fish and Wildlife, Northern Region, Yreka, CA. 23 p.

Meneks, M. 2014. 2013 Fall Chinook spawning ground survey – Salmon-Scott Rivers Ranger District. Klamath National Forest, Salmon-Scott Rivers Ranger District, Fort Jones, CA. 18 pp + appendices.

Quartz Valley Indian Reservation (QVIR). 2010. 2007-2009 summer steelhead, spring Chinook, and Pacific lamprey dive surveys, Scott River, CA. Quartz Valley Indian Reservation, CA. 16 pp.

Grider Creek – Chinook Surveys

Chinook have been observed in Grider Creek. Large-scale fish distribution surveys of the Grider Creek drainage, including its tributaries, were first conducted in 1981 (Kucas 1981), and again in 1988 (Clearwater BioSciences 1988). Chinook juveniles were found during both surveys. More recently, fish surveys reporting upon juveniles were conducted in most years 2002 through 2013. Juvenile Chinook were generally not the target, but were incidentally reported during Coho presence/absence, Spring Chinook/Summer Steelhead, or Fall Chinook surveys. Although spring-run Chinook have been confirmed in Grider Creek, they appear to be rare (Kucas 1981; USFS 1995). Spring Chinook/Summer Steelhead surveys have been conducted most years 2001 through 2013, have not observed adult spring Chinook. Much more numerous are the fall Chinook, which have been annually surveyed by CDFW and USFS since 1997, with additional records as early as 1988 (most recent report: Knechtle and Borok 2009 [CDFW]; unpub. data). The upstream extent of Chinook is an 8 foot waterfall barrier upstream of the Rancheria Creek (Kucas 1981; Clearwater BioSciences 1988).

*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary

- Chinook distribution maps include Grider Creek

Live/Dead Fish Count

- CalFish records available (1): 91460
    - Inclusive years (all datasets): 2001-2005
- Summary: No Chinook seen

Redd Count

- CalFish records available (2): 90714, 91564
    - Inclusive years (all datasets): 1988-1992, 2001-2003
- Summary: Redds recorded every year

Unpublished data and/or field notes from: 1988, 1989, 2002-2013, 1984-2013

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Knechtle, M., and S. Borok. 2009. Mid Klamath cooperative spawning ground survey, 2009. Agreement Number: 813339H001; Project Number: 2009-FISHERIES-FP-01. California Department of Fish and Wildlife, Northern Region, Yreka, CA. 8 pp.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

U.S. Forest Service (USFS). 1995. Summer steelhead/spring Chinook summer holding survey, Scott River 1995 (draft report). Scott River Ranger District. 4 pp.

Klamath River – Chinook Surveys

Chinook are present in the Klamath River in the general project area, with a focus on the reach in the vicinity of Hamburg. Specifics concerning the use of the river in this location for spawning may be less well described due to large size of the system requiring use of float boat or plane. However, surveys for Chinook juveniles during the summer do find utilization at tributary confluences and thermal refugia (Belchik 2003).

*Location restricted to general Project area (Hamburg vicinity)
*CalFish query performed on 3/25/2014

- No live/dead fish counts available
- Coho distribution maps do include Klamath River

Redd Count

- CalFish records available (2): 90397, 91590
    - Inclusive years (all datasets): 1972, 1977, 1978, 1993-2004
- Summary: Redds recorded every year
- Note: specific locations not provided – “Iron Gate Dam downstream to the Indian Creek confluence”

Unpublished data and/or field notes from: 2002-2013

Belchik, M. 2003. Use of thermal refugial areas on the Klamath River by juvenile salmonids, summer 1998. Report in fulfillment of Grant #8-FG-20-17510. Yurok Tribe. 36 pp.

Steelhead
Biologically, steelhead can be divided into two basic run-types, based on the state of sexual maturity at the time of river entry and duration of spawning migration (Moyle 2002). The stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in freshwater to mature and spawn. The ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns shortly after river entry (August 9, 1996, 61 FR 41542; Barnhart 1986). South of Cape Blanco, Oregon, summer steelhead are known to occur in the Rogue, Smith, Klamath, Trinity, Mad, and Eel rivers, and in Redwood Creek (Busby, *et al.* 1996).

Winter steelhead in California enter fresh water after rivers rise in response to fall/winter rains, typically from December through March, with a peak in January and February, with spawning soon after reaching the breeding grounds (Moyle 2002). In contrast, summer steelhead enter systems as flows taper off in the spring, then spawn the following winter (Moyle 2002). Steelhead require a minimum depth of 0.18 m and a maximum velocity of 2.44 m/s for active upstream migration (Smith 1973). Spawning and initial rearing of juvenile steelhead generally take place in small, moderate-gradient (generally 3-5%) tributary streams (Nickelson, *et al*. 1992). A minimum depth of 0.18 m, water velocity of 0.30-0.91 m/s, and clean substrate 0.6-10.2 cm (Nickelson, *et al*. 1992) are required for spawning. Steelhead spawn in 3.9-9.4°C water (Bell 1991). Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months (August 9, 1996, 61 FR 41542) before hatching, generally between February and June (Bell 1991). After two to three weeks, in late spring, and following yolk sac absorption, alevins emerge from the gravel and begin actively feeding. After emerging from the gravel, fry usually inhabit shallow water along banks of perennial streams. Fry occupy stream margins (Nickelson, *et al*. 1992). Summer rearing takes place primarily in the faster parts of pools, although young-of-the-year are abundant in glides and riffles. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Productive steelhead habitat is characterized by complexity, primarily in the form of large and small wood. Some older juveniles move downstream to rear in larger tributaries and mainstem rivers (Nickelson, *et al*. 1992). Steelhead prefer water temperatures ranging from 12-15°C (Reeves *et al*. 1987). Juveniles live in freshwater from one to four years (usually two years in the California ESUs), then smolt and migrate to the ocean in March and April (Barnhart 1986). Winter steelhead populations generally smolt after two years in fresh water (Busby, *et al*. 1996).

The KMP steelhead ESU occurs in coastal river basins between the Elk River in Oregon and the Klamath River in California, inclusive. The KMP steelhead ESU contains populations of both winter and summer steelhead. The Rogue and Klamath River basins are distinctive in that they are two of the few basins producing “half-pounder” steelhead. In 2001, NOAA-Fisheries reconsidered the status of KMP steelhead under the ESA (66 FR 17845, April 4, 2001) and determined that KMP steelhead do not warrant listing as threatened or endangered at this time.

In California, the largest proportions of naturally spawning hatchery fish are believed to occur in the Trinity River, where estimates from 1990s range from 20-70 percent hatchery. These estimates apply to fall-run fish. Because the hatchery program in the Trinity River basin propagates mostly fall-run fish, natural spawners in this basin that return at other times are believed to be predominantly of natural origin. Counts at Willow Creek weir provide an estimate of about 2000 natural origin fall-run spawners per year. The Willow Creek weir samples steelhead only over a period of about 3 months during the fall run and thus provides no information about other runs in the basin. CDFW biologists estimated natural escapement in the California portion of the ESU to be approximately 30,000-50,000 adults per year.

Rainbow Trout

Rainbow trout are native to Pacific slope drainages from the Kuskokwim River in Alaska to Baja California, Mexico (Moyle 2002). However their distribution has expanded significantly, including previously fishless streams and lakes, due to introductions. Rainbow trout is a Management Indicator Species (MIS) in on the Klamath National Forest.

Rainbow trout inhabit a wide variety of habitats. However, stream dwelling rainbows tend to prefer waters with a higher percentage of riffles than pools. Optimal habitat conditions include temperatures between 15 and 18^{o}C, slightly alkaline water (pH 7-8), and oxygen concentrations close to saturation. Temperatures above 28^{o}C are known to be lethal to rainbow trout; and for large fish, lethal temperatures may be around 23-25^{o}C. In summer, where water temperatures begin to approach the upper range of tolerance, trout will seek cooler microhabitats (Moyle 2002).

Adult forage and dispersal patterns appear to vary with local conditions, environmental factors, and the presence of other fish species (Meehan and Bjornn 1991, Moyle 2002). Rainbow trout are typically diurnal, opportunistic feeders. They are carnivores that feed in a rover-predator style. The majority of their diet consists of aquatic insects, although they will eat crayfish, grasshoppers, winged bugs, worms, salamanders, and other fish (including other trout). They occasionally feed on benthic invertebrates when the benthic food supply is great and/or when there is increased competition for prey form the water column (Behnke 2002).

Rainbow trout usually spawn between the ages of 2 to 4 years old. Age of first spawn can vary greatly depending on size and genetics (Behnke 2002). Female fecundity ranges from 1,200-3,200 eggs per kilogram of body weight (Behnke 2002). Rainbow trout spawning behavior typically begins during the spring but can begin as early as in December and varies due to temperature and water flow conditions. Temperatures of 3-6^{o}C often initiate spawning behavior, although actual spawning does not usually occur until temperatures reach 6-9^{o}C (Behnke 2002). In lakes, this often means moving from the lake into their natal stream. If the lake is not stream-fed, rainbow trout will move into near-shore shallow waters (Moyle and Cech 2000). In rivers, rainbow trout will migrate from feeding areas into smaller, cool-water tributaries (Moyle and Cech 2000). Both rainbow and steelhead trout are iteroparous, meaning that they can spawn more than once throughout their lifetime.

Fish Creek – Steelhead/Rainbow Trout Surveys

Resident rainbow trout are present in Fish Creek, but steelhead are not. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with resident rainbow trout observed in Fish Creek (Kucas 1981). Approximately 0.2 miles of the creek was considered to be suitable habitat.

The District Fish Biologist visited Fish Creek in July 2013 to check for fish and examine general habitat condition. Rainbow trout were observed above a ~4 foot plunging falls immediately above the mouth, continuing about 0.1 mile to a where it plunged over a ~5 foot tumble of boulder that appears to be the upstream limit of fish. Above the boulders was a 50 foot long bedrock chute; and then an already high gradient channel became steeper. Distance of fish occupation broadly aligns with the estimates made in the 1981 survey.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps do not include Fish Creek

Unpublished data and/or field notes from: 2013

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Kuntz Creek – Steelhead/Rainbow Trout Surveys

Resident rainbow trout are present in Kuntz Creek, but steelhead are not. Total occupation is estimated to be 0.8 miles above the mouth. The culvert under Highway 96 is a barrier to upmigrating anadromous fish (CDFW 2014a; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap material between culvert and Klamath River (less than 100 feet) is not suitable fish habitat. Although a presence/absence survey in 2005 reported “steelhead”, these fish are considered to be resident rainbow trout due to the culvert barrier: datasheets do not make the distinction between small residents and steelhead due to the impossibility to differentiate the two; and larger sizes are also rarely separated.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps do not include Kuntz Creek

Unpublished data and/or field notes from: 2002-2013, 2013

California Department Fish and Wildlife (CDFW). 2014a. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

O'Neil Creek – Steelhead/Rainbow Trout Surveys

Both steelhead and resident rainbow trout are present in O'Neil Creek. Except in the case of obvious barriers to anadromous fish, snorkel surveys generally do not make distinction between small resident trout and steelhead due to the impossibility to differentiate the two; and larger sizes are also rarely separated. Snorkel surveys conducted by Forest Service or Karuk Tribe crew in 2002, 2003, 2005, and 2011 reported steelhead/rainbow trout, as did fish surveys conducted in conjunction with habitat assessment in 2007. Prior to 2006, a culvert under Highway 96 limited Coho and Chinook occupancy to about 500 feet of channel. However, steelhead/rainbow trout have been observed upstream to approximately 0.9 mile. Although the culvert has been replaced by a bridge, design deficiencies have continued to prevent fish passage (CDFS 2014). The bridge was scheduled to complete upgrades to address this issue (CalTrans 2013).

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps not include O'Neil Creek

Unpublished data and/or field notes from: 2002, 2003, 2005, 2007, 2011

California Department of Transportation (CalTrans). 2013. Coastal anadromous fish passage assessment and remediation progress report. Annual report to the legislature for annual year 2012. California Department of Transportation, Sacramento, CA. 12 pp.

California Department Fish and Wildlife (CDFW). 2014. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

Macks Creek – Steelhead/Rainbow Trout Surveys

A mapping discrepancy exists for the steelhead distribution maps of both the Klamath National Forest and CalFish.org. Both sources indicate steelhead to be present above a culvert under Highway 96. However, field review of the of the crossing, it is the professional judgment of the District Fish Biologist that the structure is a complete barrier (perched, >6 foot water freefall to pool) to upmigrating anadromous fish. The status of steelhead below the culvert – habitat condition, presence of additional barriers – is not able to be determined due to the presence of private property.

After reviewing the data available, it is the conclusion of the District Fish Biologist, with concurrence from the Forest Fish Biologist, that steelhead presence for Macks Creek should be restricted to the approximately 500 feet between Highway 96 and the Klamath River.

Concerning resident rainbow trout on Macks Creek above Highway 96, although collaborating surveys cannot be located, Klamath National Forest fish distribution maps indicate fish to be present from the confluence of the Klamath River to a distance upstream of about 0.6 miles.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps do include Macks Creek

Unpublished data and/or field notes from: 2013

Mill Creek – Steelhead/Rainbow Trout Surveys

Although collaborating surveys cannot be located, Klamath National Forest fish distribution maps indicate resident rainbow trout to be present on Mill Creek from its confluence with the Klamath River to a distance of about 1.5 miles. There are no records for steelhead presence. The culvert under Highway 96 is a barrier to upmigrating anadromous fish (CDFW 2014a; professional judgment). Additionally, the steep gradient, exposed, boulder rip-rap and cobble alluvium material between culvert and Klamath River (less than 100 feet) is not suitable habitat.

*CalFish query performed on 3/25/2014
- No live/dead fish nor redd counts available
- Steelhead distribution maps do not include Mill Creek

Unpublished data and/or field notes from: 2013

California Department Fish and Wildlife (CDFW). 2014a. California Department of Fish and Game Passage Assessment Database. Query performed on 3/25/14.

Middle Creek – Steelhead/Rainbow Trout Surveys

A mapping discrepancy exists between steelhead distribution maps for Klamath National Forest and CalFish.org. While the former indicates steelhead to be present, the latter does not. After reviewing the data available, it is the conclusion of the District Fish Biologist, with concurrence from the Forest Fish Biologist, that there is no conclusive evidence for steelhead on Middle Creek and that the current Forest distribution map is in error.

Snorkel surveys conducted in 1989, 1996, 1997, and 1998 recorded the presence of age/size 0+ to 3+ “steelhead” trout, which is where the Forest mapping discrepancy may originate. Datasheets do not make the distinction between small resident trout and steelhead due to the impossibility to differentiate the two; and larger sizes are also rarely separated.

Middle Creek begins with a steep gradient at the confluence with Scott Creek, cumulating in a series of shallow bedrock chutes and a 4+ foot waterfall about 300 feet upstream from the mouth. In many surveys, these habitat structures have been considered to be a barrier to occupation by upmigrating fish. For instance, steelhead spawning surveys were conducted on Middle Creek in 1990, 1991, 1992, 1999, and 2002, with neither redds nor fish observed (although resident rainbow trout redds were reported in 1992). Surveyors from two of the years – 1990, 2002 – noted the difficulty of entry to Middle Creek, a persistent steep channel gradient, and overall paucity of suitable spawning substrates. Additionally, a 1989 habitat survey, completed in conjunction with the previously referenced survey that recorded “steelhead”, also noted multiple barriers just upstream the mouth. Finally, an ocular survey in 1980 began at the confluence with Scott River and continued upstream until ending at the extreme headwaters, a distance of about 3.4 miles. The 1980 surveyors considered the chutes and waterfalls at the mouth to be an impassible barrier. Fish were recorded throughout the survey distance; and although species is not provided in the notes, old fish distribution maps show resident rainbow trout, not steelhead.

The District Fish Biologist walked approximately 0.5 miles upstream Middle Creek from the mouth in 2013 in order to examine general habitat condition. Similar to past stream surveys, the fish biologist questioned the likelihood of steelhead entering Middle Creek due to multiple barriers near the confluence and continual steep gradient throughout the hiked distance. Furthermore, very few patches of spawning substrate suitable for steelhead use was observed.

*CalFish query performed on 3/25/2014
- No live/dead fish nor read counts available
- Steelhead distribution maps do not include Middle Creek

Unpublished data and/or field notes from: 1989, 1990, 1991, 1992, 1999, 2002, 2013
U.S. Forest Service (USFS). 1998. Juvenile fish survey – Middle Creek. Unpub. data.
U.S. Forest Service (USFS). 1980. Stream survey – Middle Creek. Unpub. data.

Rancheria Creek – Steelhead/Rainbow Trout Surveys

Both steelhead and resident rainbow trout have been observed on Rancheria Creek. Surveys quantifying distribution of various fish species in the Grider Creek and its tributaries, including Rancheria Creek, were conducted in 1981 and 1988. The 1981 survey found rainbow trout within an estimated 1.0 mile of suitable habitat, and suggested the possibility of steelhead downstream of an anadromous fish barrier (at 0.5 miles) (Kucas 1981). The 1988 survey observed rainbow trout, and furthermore encountered steelhead redds below the barrier (Clearwater BioSciences 1988).

The District Fish Biologist visited Rancheria Creek in July 2013 to check for fish and examine general habitat condition. The definite barrier mentioned by Kucas (1981) at 0.5 miles was found, as well as multiple partial barriers downstream, two of which could limit upstream movement by anadromous fish. At least one of these barriers appears relatively new and was probably created since 1981, likely during a flood event such as 1997. While steelhead/rainbow trout were seen downstream of the 0.5 mile barrier, none were seen upstream. However, the investigation did not continue through the entire area as surveyed in 1981 and 1988, and so may have missed resident rainbow trout if they were rare in numbers.

*CalFish query performed on 3/25/2014
- No live/dead fish nor redd counts available
- Steelhead distribution maps do not include Rancheria Creek

Unpublished data and/or field notes from: 2013

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Tompkins Creek – Steelhead/Rainbow Trout Surveys

Steelhead and resident rainbow trout have been observed in Tompkins Creek. Steelhead distribution is about 3.7 miles of the mainstem, 0.9 miles of an unnamed "west fork" tributary, and 0.7 miles of an unnamed "north fork" tributary. Resident rainbow trout are within the same range of steelhead, but also inhabit an additional 0.3 miles of the mainstem and about 0.25 miles of an unnamed tributary just above the 46N64 bridge.

Extensive spawning surveys for steelhead have been conducted in Tompkins Creek, including 1980-1986, 1988-1992, 1997-1999, 2002, and 2013. Surveys between 1980 and 1992 all recorded redds and/or live fish, while from 1997 to 2002 found nothing; and the 2013 survey observed three redds. The reason for the difference in observation is likely twofold. First, many of the surveys in the 1980s and early 1990s were investigating escapement, and therefore tended to include multiple visits during the spawning season. Second, notes associated with some of the later surveys report impacts following the 1997 flood that may have decreased spawning habitat suitability. The presence of redds in 2013 indicates appropriate habitat is again available for spawning.

Live fish surveys, generally targeting juveniles, have also occurred on Tompkins Creek. Except in the case of obvious barriers to anadromous fish, snorkel surveys generally do not make distinction between small resident trout and steelhead due to the impossibility to differentiate the two; and larger sizes are also rarely separated. Electroshocking occurred in 1988 and 1989 to track juvenile fish abundance and biomass (USFS 1989). Steelhead/rainbow trout snorkel surveys were conducted in 1989, 1990, 1996-1998, and 2005 with fish found in all years. Finally, fish observed during an ocular survey in 1978 were not identified as to species, but were most likely steelhead/rainbow trout.

In February 2013, the District Fish Biologist walked approximately 1.0 miles upstream Tompkins Creek beginning at the corral in order to examine general habitat condition. A redd search was concurrently conducted, but none were seen. However, the survey may have been a bit early to expect fish in Tompkins Creek most years, as seen when examining positive spawning survey dates from the 1980s. A follow-up redd survey in April observed three steelhead and two resident rainbow trout redds.

*CalFish query performed on 3/25/2014

- No live/dead fish or redd counts available
- Steelhead distribution maps do include Tompkins Creek

Unpublished data and/or field notes from: 1980-1986, 1988- 1992, 1996-1999, 2002, 2013

U.S. Forest Service (USFS). 2006. Habitat utilization by juvenile Coho salmon in selected tributaries of the Scott River, 2005. Report prepared by Northern California Resource Center for Klamath National Forest, Scott River, Fort Jones, CA. 31 pp + appendices.

U.S. Forest Service (USFS). 1998a. Juvenile fish survey – Tompkins Creek. Unpub. data.
U.S. Forest Service (USFS). 1998b. Fish census dive 1997-1998 – Tompkins and Kelsey Creek. 7 pp.
U.S. Forest Service (USFS). 1989. 1989 Juvenile steelhead electroshocking population survey (Tompkins Creek, Siskiyou County). 2 pp.
U.S. Forest Service (USFS). 1978. Stream survey – Tompkins Creek. Unpub. data.

Tyler Meadow Creek – Steelhead/Rainbow Trout Surveys

Resident rainbow trout are present in Tyler Meadow Creek, but steelhead are not. A survey quantifying distribution of various fish species in the Grider Creek and its tributaries was conducted in 1981, with resident rainbow trout observed in Tyler Meadow Creek (Kucas 1981). Approximately 0.3 miles of the creek was considered to be suitable habitat.

*CalFish query performed on 3/25/2014

- No live/dead fish nor redd counts available
- Steelhead distribution maps do not include Tyler Meadow Creek

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Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Scott River – Steelhead/Rainbow Trout Surveys

Steelhead and resident rainbow trout are present in the Scott River in the general project area, with a focus on the reach between Scott Bar and Middle Creek. Specifics concerning suitability of the river in this location for spawning is poorly known due to often hazardous discharge conditions which are present in spring. However, the rotary screw trap operated by the CDFW annually records downmigrating smolts in the spring (Daniels, *et al*. 2011); and the video weir upstream of Indian Scotty Campground regularly captures movement of fish in the fall and early winter (Knechtle and Chesney 2014). Finally, dive investigations into the presence/absence of summer steelhead occurred 2007 through 2009, with adults and/or half-pounders recorded each year within deep pools of the Scott River adjacent the Project (QVIR 2010).

*Location restricted, where possible, to general Project area (Scott Bar to Middle Creek)
*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary
- No redd counts available
- Steelhead distribution maps include the Scott River in the Project area

Live/Dead Fish Count

- CalFish records available (2): 90360, 91034
    - Inclusive years (all datasets): 1992-1997
- Summary: Steelhead recorded in 1994, 1995, 1997
- Note: specific locations not provided, but often mouth to Fort Jones

Other – Weir Operations (near mouth)

- CalFish records available (2): 90420, 90421
    - Inclusive years (all datasets): 1982-1985, 1987, 1989- 1991
- Summary: Steelhead recorded all years

Daniels, S., Debrick, A., Diviney, C., Underwood, K., Stenhouse, S., and W. Chesney. 2011. Final report Shasta and Scott River juvenile salmonid outmigrant study, 2010. Report #P071307. California Department of Fish and Game, Northern Region, Yreka, CA. 97 p.

Knechtle, M., and D. Chesney. 2014. 2013 Scott River salmon studies final report. California Department Fish and Wildlife, Northern Region, Yreka, CA. 23 p.

Quartz Valley Indian Reservation (QVIR). 2010. 2007-2009 summer steelhead, spring Chinook, and Pacific lamprey dive surveys, Scott River, CA. Quartz Valley Indian Reservation, CA. 16 pp.

Grider Creek – Steelhead/Rainbow Trout Surveys

Steelhead and resident rainbow trout are present in Grider Creek. In total, steelhead occupy about 12.2 miles of Grider Creek mainstem, and resident rainbow trout 14.6 miles. The upstream extent of steelhead and rainbow trout is likely due to a combination of discharge, steep gradients, and/or barriers.

Large-scale fish distribution surveys of the Grider Creek drainage, including its tributaries, were first conducted in 1981 (Kucas 1981), and again in 1988 (Clearwater BioSciences 1988). Both resident rainbow trout and steelhead were found throughout the drainage during the surveys, with an 8 foot waterfall barrier described upstream of the Rancheria Creek confluence. While the waterfall was believed to be a barrier to Coho and Chinook (the former has since been found above), it was thought to be passable by spawning steelhead given an appropriately high water discharge.

Various types of fish surveys have been conducted most years 2002 through 2012. Except in the case of obvious barriers to anadromous fish, surveys which focus upon juveniles do not make distinction between small resident trout and steelhead due to the impossibility to differentiate the two; and larger sizes are also rarely separated. In the 2002-2013 survey period, steelhead/rainbow trout were incidentally reported during Coho presence/absence surveys and fall Chinook spawning surveys; and were specifically targeted during summer steelhead and general fish presence/absence surveys. For all years, steelhead and/or resident rainbow trout were observed.

A summer steelhead census that occurred in 1982 did not see fish, although the report did note that steelhead had been observed in the past (CDFW 1982). One summer steelhead was observed during a fish survey in 1981 (Kucas 1981). More recently, summer steelhead surveys have been conducted most years 2001 through 2013, with fish regularly observed.

Specifics concerning use of the creek for spawning is poorly known due to often hazardous discharge conditions which are present in spring, as well as snow creating access difficulties.

Redds and live fish were observed during steelhead spawning surveys conducted in 1989 and 2002.

*CalFish query performed on 3/25/2014

- See project record for expanded datasets referred in summary
- No redd counts available
- Steelhead distribution maps include Grider Creek

Live/Dead Fish Count

- CalFish records available (2): 90583, 90907
    - Inclusive years (all datasets): 1969, 1982, 1998, 2001-2005
- Summary: Steelhead seen 1969, 2001, 2002, 2004, 2005

Unpublished data and/or field notes from: 1989, 2002-2013

California Department Fish and Wildlife (CDFW). 1982. Siskiyou County spring run king salmon and steelhead inventories – 1982. 6 pp.

Clearwater BioSciences, Inc. 1988. Fish habitat characteristics and salmonid abundance in the Grider Creek drainage during June 1988. Prepared for Klamath National Forest, P.O. # 40-91W8-8-1572. 18 pp + appendices.

Kucas, S. 1981. Grider Creek area drainage development plan and environmental assessment – fisheries resource evaluation. Prepared for Klamath National Forest in partial fulfillment of contract 53-91S8-1-6493 by LSA. 18 pp.

Klamath River – Steelhead/Rainbow Trout Surveys

Steelhead and rainbow trout are present in the Klamath River in the general project area, with a focus on the reach in the vicinity of Hamburg. Specifics concerning suitability of the river in this location for spawning is poorly known due to often hazardous discharge conditions which are present in spring. However, surveys for steelhead juveniles during the summer do find utilization at tributary confluences and thermal refugia (Belchik 2003).

*Location restricted to general Project area (Hamburg vicinity)
*CalFish query performed on 3/25/2014

- No live/dead fish or redd counts available
- Steelhead distribution maps do include Klamath River

Unpublished data and/or field notes from: 2002-2012

Belchik, M. 2003. Use of thermal refugial areas on the Klamath River by juvenile salmonids, summer 1998. Report in fulfillment of Grant #8-FG-20-17510. Yurok Tribe. 36 pp.

Critical Habitat for Coho Salmon (and) Essential Fish Habitat for Coho/Chinook Salmon

Designated Critical Habitat (CH) for Coho salmon encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between the Mattole River in California and the Elk River in Oregon, inclusive (May 5, 1999, 64 FR 24049). The area described in the final rule represented the current freshwater and estuarine range of Coho salmon. Land ownership patterns within the Coho salmon ESU analyzed in this document and spanning southern Oregon and northern California are 53% private lands; 36% Federal lands; 10% State and local lands; and 1% Tribal lands. The Forest Service manages about 1,680,000 acres (90.6%) of land within the Forest boundaries and about 200,000 acres (9.4%) of land are within the Forest boundaries but in other ownership (LRMP, Page 3-12). Essential Fish Habitat (EFH) is considered for both Coho and Chinook salmon, with consultation occurring under 305 (b) (4) (A) of the Magnuson-Stevens Fishery Conservation and Management Act. The definition of Coho/Chinook EFH components and extent is described by Amendment 14 (Appendix A, pages 12-35 [adopted year 2000]) of the 1978 Pacific Fisheries Management Council Salmon Fisheries Management Plan.

Conclusions regarding CH and EFH occurrence are based on field review of habitat suitability, professional judgment, District fish survey records, and California Department of Fish and Wildlife (CDFW) information. In general, the KNF Coho Presence (GIS) layer defines CH, and Coho or Chinook distribution (whichever is of maximal extent) defines EFH. As appropriate, the California state information in Calfish.org may also be utilized. Where information on Coho or Chinook is lacking (e.g., no/few surveys have been completed), else it is the professional judgment of the Fish Biologist that neither KNF nor Calfish.org range maps fully capture CH/EFH extent, the KNF Steelhead Trout Distribution (GIS) layer may be used as a proxy for maximum range of anadromous fishes. This dataset is recognized as a conservative approach for assessment of effects to anadromous fish habitat because Coho and Chinook salmon may not occupy the same waters as steelhead due to differences in jumping abilities. The maximum jumping height (under ideal conditions) for Coho is 2.2 meters; Chinook salmon is 2.4 meters; and steelhead is 3.4 meters (Meehan 1991). Therefore, steelhead trout can access more habitat than Coho or Chinook salmon (i.e., steelhead trout can make a 3-meter jump to migrate up a stream, but Coho and Chinook salmon cannot.). Additionally, differences in spawn timing may also affect actual distribution. As an example, steelhead spawn in the spring, encountering higher discharge conditions than Chinook, which spawn in the fall. In consequence, Chinook may be denied access to streams, or segments thereof, due to the presence of low-water barriers that are passible to steelhead during spring flows.

In all cases, field review and site-specific surveys may refine the location of CH or EFH.

Maps 5 and 6 show the distribution of CH and EFH the Action Area and Analysis Area. This map is based on fish distribution with site-specific changes made per professional fisheries biologist knowledge, stream surveys, or CDFW data. Field review, survey history, and CalFish.org agree that Coho presence is appropriately reflected by the existing Forest Service map database for the Project area. Extensive fish surveys have occurred in both Grider Creek and Tompkins Creek, defining Coho distribution. Therefore, Coho distribution (and, thus, CH) <u>will not</u> follow steelhead distribution in the Project area, instead utilizing the Klamath National Forest and CalFish.org maps. Elsewhere in the Project area, barriers, such as those at the mouth of Middle Creek, low stream discharge, and/or steep gradients lacking pool habitat control distribution of Coho and other anadromous fish, both adults and juveniles. Since the extent of Coho is greater than that of Chinook, Coho distribution will also define EFH for the Project area.

Lamprey

Pacific Lamprey (Entosphenus tridentata)

Pacific lamprey are found in north Pacific coast streams from Japan, through Alaska, and down the North America continent coast, potentially as far as southern California or Baja California (USFWS 2012; Moyle 2002). This species has many derivative forms, including anadromous (the most common), resident, and landlocked; and the relationship between *E. tridentata* and its multiple forms, as well as similar species, is not fully resolved (Moyle 2002). Pacific lamprey is a Sensitive species for the Klamath National Forest.

Pacific lamprey are usually anadromous, with two distinct parts of their complex life cycle. Following is a generalized life cycle description, as summarized from Moyle (2002), Close, *et al*. (2010), and USFWS (2012). After hatching in freshwater in the late spring and early summer, larvae (ammocoetes) leave the nest and passively drift until suitable substrate – sand/silt – is encountered. Once a site is colonized, the blind larvae filter feed upon detritus for an extended period of time. Length of in-stream residence is uncertain, an individual may retain a larval form between three to seven years, with four to six years typical. Time to metamorphosis is dependent upon how long it takes to grow to a particular size. At 14-16 centimeter total length, larvae begin metamorphosis to the ocean-going adult form. Metamorphosis occurs over multiple months, and requires physiological changes from sessile filter-feeder to active predator, including changes in sensory system (such as growing eyes), digestive system, and tolerance to sea water. Downstream migration appears correlated with high flow events of winter and spring. Adults spend up to four years in the ocean where feeding is by parasitism: an individual latches to its prey (usually fish, but sometimes marine mammals), rasps a hole through the skin, extracts body fluids and flesh, and finally drops off once full. Upmigration from the ocean occurs from winter through early summer, although lamprey may hold in a river up to a year before the final migration into spawning streams. Once the spawning migration starts, lamprey stop eating. Pacific lamprey do not appear to home to a natal stream, instead following the smell of pheromones produced by ammocoetes to find suitable spawning habitat. In late spring through early summer, nests are constructed, and while some adults may survive to return to the ocean, most die soon after spawning.

Specifics of the general Pacific lamprey life cycle as applied to the Klamath River system, much less its individual tributaries, are largely uncertain. Initial movement of spawners from the ocean into the river may occur at any time of the year, but is primarily late winter and into spring (Larson and Belchik 1998, Close, *et al*. 2010). Additionally, there is evidence of at least two distinct runs: a spring run that spawns shortly after entering freshwater, and a fall run that holds over and spawns the following spring (Anglin 1994). Downstream emigration of lamprey occurs year-round, with final outmigration to saltwater of transformed adults in late fall through spring (Anglin 1994; Close, *et al*. 2010). Other particulars, such as details about the ammocoete stage and spawning specifics (i.e., months, locations) for the various Klamath River tributaries, are unknown.

Habitat for Pacific lamprey ammocoetes is very important due to the long in-stream residence. Sands and silts are the preferred habitat of larvae, with larger substrate sizes utilized by larger (older) individuals (Sugiyama and Goto 2002; Stone and Barndt 2005). Finer particles are endemic of lower velocity environments such as stream margins, backwaters, eddies, and pools. Although ammocoetes are often considered to be sedentary, they will actively seek new habitat if a particular site becomes unsuitable (Moyle 2002; USFWS 2010). Most important is that the stream velocity has to be fast enough to allow filter feeding, yet sufficiently slow to retain the preferred sediments (Torgensen and

Close 2004). For poorly known reasons, distribution of lamprey larvae in a stream tends to be patchy – not all suitable habitats are utilized – but it may be a function of microhabitat, variation between stream reaches, and seasonal movement to take advantage of different habitat (Sugiyama and Goto 2002; Torgensen and Close 2004). Optimal temperature requirements for ammocoetes, as well as other water quality parameters, needs further study. However, it is known that eggs will successfully hatch from 10° to 22°C, with highest survival 10° to 18°C; and that local spawning peaks are likely tied with water temperatures most advantageous for embryo development (Meeuwig, *et al*. 2005).

Pacific lamprey spawning habitat is very similar to that required by salmonids. Redds are generally built in gravel and cobble substrates, with moderate velocity flowing water. Of the 125 Pacific lamprey nests surveyed in the Smith River, Oregon, most were observed in low gradient riffles, pool tailouts and lateral scour pools (Gunckel, *et al*. 2009). Most of these nests were associated with cover, including gravel and cobble substrates, vegetation and woody debris. Likewise, most nests observed in Cedar Creek, Washington, were observed in pool-tail outs, low gradient riffles and runs (Stone 2006). Upstream extent of spawning Pacific lamprey is often considered synonymous with salmonid anadromy, although there are indications that this assumption may not always be true – under natural conditions, lamprey may be able to pass traditional barriers to upmigrating steelhead and salmon, such as waterfalls (USFWS 2012). Research is on-going on this topic. Until consensus is reached within the scientific community, it is appropriate to continue to utilize salmonid anadromy as Pacific lamprey extent.

Pacific lamprey numbers in the Klamath River appear to be decreasing. While there is no estimate of the current population, oral history taken from tribal fishers indicates a long-term decline in adult catch (Larson and Belchik 1998; USFWS 2012). Additionally, a downward trend is suggested for outmigrating juveniles caught in rotary screw traps in the Klamath River basin between 1997 and 2004 (USFWS 2004).

Klamath River Lamprey (Entosphenus similis)

Klamath River lamprey are found in the upper and lower Klamath River system, including its tributaries (Moyle 2002). This species is non-migratory and can be found within both rivers and lakes (Moyle 2002; CWS 2013). Klamath River lamprey is a Sensitive species for the Klamath National Forest.

Specifics concerning the life history and habitat needs of the Klamath River lamprey are few, but it is presumed to be broadly similar to the Pacific lamprey. One primary difference is that this species is limited to freshwater (i.e., is not anadromous), and therefore adults feed on prey such as salmonids, suckers, and cyprinids throughout their life (Moyle 2002; CWS 2013). Downstream of Iron Gate Dam, the distribution of Klamath River lamprey is presumed to be similar to anadromous salmonids, its primary food source (CWS 2013).

All Locations – Lamprey Surveys

Understanding of the full extent of distribution of Sensitive lamprey species within Project area waterways is unknown. In the Scott River, Pacific lamprey and Klamath river lamprey are annually captured in the CDFW rotary screw trap located just upstream of Scott Bar, the former appearing to comprise a larger proportion of the population than the latter (most recent report: Daniels, *et al*. 2011). Other observations in the lower Scott River include 1995 and 2009 during spring Chinook/summer steelhead census snorkel surveys (QVIR 2010; USFS unpub. data). The extent of lamprey in Grider Creek unknown, but a dead lamprey was reported in 2007 during summer steelhead survey, exact location not given (USFS unpub. data). For the Klamath River, both Pacific lamprey and Klamath River lamprey are known to be present (Close, *et al*. 2010). Elsewhere, habitat for Pacific lamprey may be present within the Project area, especially Tompkins Creek.

Unpublished data and/or field notes from: 1995, 2002-2012

Close, D., Docker, M., Dunne, T., and G. Ruggerone. 2010. Scientific assessment of two dam removal alternatives on lamprey – Klamath River Expert Panel. Final report prepared for U.S. Fish and Wildlife Service, Washington, D.C. 56 p + appendices.

Daniels, S., Debrick, A., Diviney, C., Underwood, K., Stenhouse, S., and W. Chesney. 2011. Final report Shasta and Scott River juvenile salmonid outmigrant study, 2010. Report #P071307. California Department of Fish and Game, Northern Region, Yreka, CA. 97 p.

Quartz Valley Indian Reservation (QVIR). 2010. 2007-2009 summer steelhead, spring Chinook, and Pacific lamprey dive surveys, Scott River, CA. Quartz Valley Indian Reservation, CA. 16 pp.

References

Anglin, D.R. 1994. Lower Klamath River instream flow study: scoping evaluation for the Yurok Indian Reservation. Completed under interagency agreement No: AG1J520003. U.S. Fish and Wildlife Service Lower Columbia River Fishery Resource Office, Vancouver, WA. 46 p.

Barnhart, R.A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest) – steelhead. U.S. Fish and Wildlife Service Biological Report 82 (TR-EL-82-4/82-11-60). 27 p.

Behnke, R.J. 2002. Trout and Salmon of North America. (George, S., ed.). The Free Press, New York, New York. 359 p.

Bell, M.C. 1991. Fisheries handbook of engineering requirements and biological criteria, 3rd edition. U.S. Army Corps of Engineers, Portland, Oregon.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. Technical Memorandum NMFS-NWFSC-27. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.
Available online: http://www.nwfsc.noaa.gov/publications/techmemos/tm27/tm27.htm

California Department of Fish and Wildlife (CDFW). 2014b. Klamath River basin fall Chinook salmon spawner escapement, in-river harvest and run-size estimates, 1979-2013. Available from W. Sinnen, CDFW, 5341 Ericson Way, Arcata, California.

Close, D., Docker, M., Dunne, T., and G. Ruggerone. 2010. Scientific assessment of two dam removal alternatives on lamprey – Klamath River Expert Panel. Final report prepared for U.S. Fish and Wildlife Service, Washington, D.C. 56 p + appendices.

Gunckel, S.L., Jones, K.K., and S.E. Jacobs. 2009. Spawning distribution and habitat use of adult pacific and western brook lampreys in Smith River, Oregon. American Fisheries Society Symposium 72: 173-189.

Hassler, T.J. 1987. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest). Coho Salmon. U.S. Fish and Wildlife Service Biological Report 82(11.70). 26 p.
Available online: http://www.nwrc.usgs.gov/wdb/pub/species_profiles/82_11-070.pdf

Healey, M.C. 1991. Life history of Chinook salmon (*Oncorhynchus tshawytscha*). Pages 313-393 *in* Pacific Salmon Life Histories (C. Croot and L. Macolis, eds.). UBC Press, University of British Columbia, Vancouver, BC.

Klamath River Technical Team (KRTT). 2014. Ocean abundance projections and prospective harvest levels for Klamath River Fall Chinook, 2014 Season.
Available online: http://www.pcouncil.org/wp-content/uploads/krtt.stock_.proj_.final_.05Mar2014.pdf

Larson, Z.S., and M.R. Belchik. 1998. A preliminary status review of eulachon and Pacific lamprey in the Klamath River Basin. Yurok Tribal Fisheries Program, Klamath, CA. 24 p.

McCullough, D.A. 1999. A review and synthesis of effects of alterations to the water temperature regime on freshwater life stages of salmonids, with special reference to Chinook salmon. Report EPA 910-R-99-010. U.S. Environmental Protection Agency, Seattle, Washington. 291 p.
Available online: http://www.krisweb.com/biblio/gen_usepa_mccullough_1999.pdf

Meehan, W.R. (ed.). 1991. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19.

Meehan, W.R. and T.C. Bjornn. 1991. Salmonid distribution and life histories. *in* Influences of forest and rangeland management on salmonid fishes and their habitats (Meehan, W.R., ed.). American Fisheries Society Special Publication 19:47-82.

Meeuwig, M.H., Bayer, J.M., and J.G. Seelye. 2005. Effects of temperature on survival and development of early life stage Pacific and western brook lampreys. *Transactions of the American Fisheries Society* 134: 19-27.

Meyers, J.M., R.G. Kope, G.J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K. Neely, S.T. Lindley, and R.S. Waples. 1998. Status review of Chinook salmon from Washington, Idaho, Oregon, and California. Technical Memorandum NMFS-NWFSC-35. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.
Available online: http://www.fws.gov/yreka/HydroDocs/Myers_etal_1998.pdf

Moyle, P.B. 2002. Inland Fishes of California. University of California Press, Berkeley, California. 502 p.

Moyle, P.B., and J.J. Cech, Jr. 2000. Fishes: an introduction to ichthyology. 4th edition. Prentice-Hall, Saddle River, New Jersey.

National Marine Fisheries Service (NMFS). 2007. Magnuson-Stevens Reauthorization Act Klamath River Coho Salmon Recovery Plan. Prepared by Rogers, F. R., I. V. Lagomarsino and J. A. Simondet for the National Marine Fisheries Service, Southwest Region Long Beach, California. 48 p.
Available online: http://www.swr.noaa.gov/salmon/MSRA_RecoveryPlan_FINAL.pdf

National Marine Fisheries Service (NMFS). 2001. Biological Opinion. Ongoing Klamath Project Operations. National Marine Fisheries Service, Southwest Region, Long Beach, California. 61 p.
Available online: http://swr.nmfs.noaa.gov/psd/kbo.pdf

Reeves, G.H., F.H. Everest, and J.B. Hall. 1987. Interactions between the redside shiner (*Richardsonius balteatus*) and the steelhead trout (*Salmo gairdneri*) in western Oregon: the influence of water temperatures. *Canadian Journal of Fish and Aquatic Science* 44: 1603-1613.

Sandercock, F.K. 1991. Life history of Coho salmon (*Oncorhynchus kisutch*). Pages 397-446 *in* Pacific Salmon Life Histories (C. Croot and L. Macolis, eds.). UBC Press, University of British Columbia, Vancouver, BC.

Smith, A.K. 1973. Development and application of spawning velocity and depth criteria for Oregon salmonids. *Transactions of the American Fisheries Society* 102: 312-316.

Stone, J. 2006. Observations on nest characteristics, spawning habitat, and spawning behavior of Pacific and western brook lamprey in a Washington stream. *Northwestern Naturalist* 87: 225-232.

Stone, J., and S. Barndt. 2005. Spatial distribution and habitat use of Pacific lamprey (*Lampetra tridentata*) ammocoetes in a western Washington stream. *Journal of Freshwater Ecology* 20: 171-185.

Sugiyama, H. and A. Goto. 2002. Habitat selection by larvae of a fluvial lamprey, *Lethenteron reissneri*, in a small stream and an experimental aquarium. *Icthyological Research* 49: 62-68.

Torgensen, C.E., and D.A. Close. 2004. Influence of habitat heterogeneity on the distribution of larval Pacific lamprey (*Lampetra tridentata*) at two spatial scales. *Freshwater Biology* 49: 614-630.

U.S. Fish and Wildlife Service (USFWS). 2012. Pacific lamprey (Entosphenus tridentatus) – assessment and template for conservation measures in California. U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, CA. 117 p.

U.S. Fish and Wildlife Service (USFWS). 2010. Best management practices to minimize adverse effects to Pacific lamprey. U.S. Fish and Wildlife Service, Pacific Region, Portland, OR. 25 p.

U.S. Fish and Wildlife Service (USFWS). 2004. 90-day finding on a petition to list three species of lamprey as threatened or endangered. *Federal Register* 69: 77158-77167.

Weitkamp, L.A., T.C. Wainwright, G.J. Bryant, G.B. Milner, D.J. Teel, R.G. Kope, and R.S. Waples. 1995. Status review of Coho salmon from Washington, Oregon, and California. Technical Memorandum NMFS-NWFSC-24. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.
Available online: http://www.nwfsc.noaa.gov/publications/techmemos/tm24/tm24.htm

APPENDIX C: TABLE OF PATHWAY AND INDICATORS

Klamath National Forest Matrix: Table of Population and Habitat Indicators for Use on the Klamath National Forest in the Northwest Forest Plan Area

Aquatic Habitat Conditions Analysis Guidelines

AP = Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area (USDI, USDA, and NOAA 2004).
Available at www.blm.gov/or/esa/reports/Analytical_Process_110504.doc.

The table(s) within this Appendix show criteria used to determine baseline conditions in 7th-and 5th-field watersheds within the KNF boundaries **that contain anadromous fish habitat**. The criteria in the Table and footnotes are used to describe the current condition of Klamath Mountains watersheds, and to determine if projects are likely to affect anadromous salmonids via effects on salmonid habitat components. Current conditions of watershed(s) are assessed and documented in the Table of Habitat Indicators; and effects to Indicators from proposed actions are discussed in the narrative within the BA/BE and summarized in the Table of Habitat Indicators.

The initial KNF-NMFS Level 1 review of the Table criteria was completed by Perrochet, Thomas, and Flickinger in April 2007. Edits to LWD were made in March 2009 to reflect LRMP EIS values. The Table was updated in 2004 as part of the Analytical Process for ESA consultation with NMFS. In May 2012 Grunbaum and Meneks provided updates/edits to this document and the Table of Habitat Indicators.

The Table, as designed in the 2004 Analytical Process, and in earlier versions (1997 NMFS BO for the LRMP), suggests values to determine a level of functioning for anadromous fish bearing streams. A note about rigid values to assess level of functioning: in addition to fixed habitat parameters not allowing for natural variability, fixed habitat parameters set standards that may be geomorphically inappropriate (Bisson et al. 1997). Variability is an inherent property of aquatic ecosystems in the Pacific Northwest and habitats at any given location will change from year to year, decade to decade, and century to century (Bisson et al. 1997). Healthy lotic ecosystems require different parts of the channel system to exhibit very different in-channel conditions and that those conditions change through time (Reid and Furniss 1998). Also, data may not be available for the stream being assessed. Therefore, a conclusion of function must be evaluated with professional judgment recognizing the streams capability to perform within rigid values. In some cases, a stream's morphology, aspect or size may not support "Properly Functioning" criteria values for one or more habitat Indicators. If an Indicator for a particular stream is determined to be functioning at its capability (due to morphology, aspect, or size), it is rated as Properly Functioning even if it doesn't meet Table criteria values. In the absence of available data, table and associated footnotes suggest factors that should be considered when evaluating indicators.

Klamath National Forest Tributaries Table of Pathways and Indicators

Klamath National Forest Tributaries Table of Pathways and Indicators:				
Pathways	***Indicators***	***Properly Functioning***	***At Risk***	***Not Properly Functioning***
Habitat: Non Watershed Condition Indicators				
Water Quality:	Temperature **(1)**			
	1st - 3rd Order Streams [instantaneous]	69 F degrees (~ 20.5 C) or less	> 69 to 70.5 degrees F	70.5 F degrees (~ 21.3 C) or more
	4th-5th Order Streams [Maximum Weekly Maximum Temperature]	70.5 F degrees (~ 21.4 C) or less	> 70.5 to 73.5 degrees F	73.5 F degrees (~ 23.0 C) or more
	Suspended Sediment/Turbidity	Little to no quantitative turbidity data exists for streams on the Klamath National Forest. Use the following criteria to infer condition of turbidity Indicator: (1) professional judgment from years of direct observation of tributary streams; (2) amount of fines in substrate from stream survey data, (3) CWE modeled level of watershed surface erosion and mass wasting, and (4) condition of stream buffer RR and channel (particularly if there has been recent debris flows that altered the channel). Professional judgment of turbidity is based on observations of water clarity after peak flows in tributaries to the mainstems of the Klamath, Scott, and Salmon Rivers that have watersheds with varying degrees of disturbance from nearly pristine to highly disturbed. Properly Functioning: Water clarity returns quickly (within three days) following peak flows.	Water clarity slow (four to six days) to return following peak flows, moderate to high fines in substrate, moderate modeled surface erosion and mass wasting, and riparian reserves are not fully functioning.	Water clarity poor for long periods of time (one week or more) following peak flows. Some suspended sediments occur even at low flows or base flow. High fines in substrate, stream buffers in poor condition, high modeled surface erosion and mass wasting, and riparian reserves are in poor condition.
	Chemical/Nutrient Contamination **(2)**	Scott, Salmon, and Klamath River mainstems: Low levels of contamination from agriculture, industrial, and other sources; no excess nutrients. No CWA 303d designated reaches. Scott, Salmon, and Klamath River tributaries: None or low levels of chemical and/or nutrient contamination from agriculture, industrial, and other sources; no excess nutrients.	Scott, Salmon, and Klamath River mainstems: Moderate levels of contamination from agriculture, industrial, and other sources; some excess nutrients. One or more CWA 303d designated reaches Scott, Salmon, and Klamath River tributaries: Moderate levels of contamination from agriculture, industrial, and other sources and/or moderate excess nutrients.	Scott, Salmon, and Klamath Rivers: mainstems: High levels of contamination from agriculture, industrial, and other sources; high levels of nutrients. One or more CWA 303d designated reaches Scott, Salmon, and Klamath River tributaries: High levels of contamination from agriculture, industrial, and other sources and/or moderate to high excess nutrients.
Habitat Access:	Physical Barriers (AP)	Any man-made barriers present in watershed allow upstream and downstream passage at all flows.	One or more human -made barriers present in watershed do not allow upstream and/or downstream passage at base/low flows.	Human-made barriers present in watershed do not allow upstream and/or downstream passage at a range of flows for at least one life history stage.

Klamath National Forest Tributaries Table of Pathways and Indicators:

Pathways	*Indicators*	*Properly Functioning*	*At Risk*	*Not Properly Functioning*
Habitat Elements:	Substrate character **(3)**	Use stream survey data for determining substrate character. In addition, use USLE and GEO models to determine functioning level of Indicator and potential effects of sediment delivery to streams that may affect anadromous fish and their habitat. Can also infer substrate character functioning level from other factors such as high road density and hydrologic connection, recent large intense wildfires, and recent (last 20 years) altered channel.		
		Less than 15% fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and cobble embeddedness less than 20%. Additional desired conditions, as per TMDL/NCRWB water quality compliance, include: *Pool sediment vol (V*): ≤21% *Subsurface, <0.85 mm: ≤14% *Subsurface, <6.4 mm: ≤30%	15% or greater fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and/or cobble embeddedness is 20% or greater.	Greater than 20% fines (<2 mm) in spawning habitat (pool tail-outs, low gradient riffles, and glides) and cobble embeddedness greater than 25%.
	Large Woody Debris **(4)**	See KNF LRMP EIS Chapter 3, text and tables on Pages 68-69. For stream reaches on the Westside of the Forest, manage for an average of 20 pieces of large wood per 1,000 ft in 3-5th order streams (LRMP Page 4-143). Large wood is defined as a minimum length of 50 feet and diameter of 24 inches on the Westside. However, site potential and channel width must be considered rather than using strict numbers. Also consider the potential for future LWD recruitment in both the short- and long-term.	Current levels are being maintained at minimum levels desired for "properly functioning" but potential sources for long term woody debris recruitment are lacking to maintain these minimum values.	Current levels are not at those desired levels for "properly functioning" and potential sources of woody debris for short and/or long term recruitment are lacking.
	Pool Quality and Frequency **(5)**	At least one primary pool every three to seven bankfull channel widths. In 1st through 3rd order streams, a primary pool must have a maximum depth of two feet or greater. In 4th and 5th order streams, a primary pool must have a maximum depth of three feet or greater. In 6th order and larger streams, a primary pool must have a maximum depth of four feet or greater.	At least one pool every three to seven bankfull channel widths. At least half of the pools are primary pools. At least half the pools have a maximum depth of at least 24 inches (1st- 3rd order streams) or 36 inches (4th order and greater).	There is less than one pool every three to seven bankfull channel widths and/or less than half the pools have maximum depth of at least 24 inches (1st-3rd order streams) or 36 inches (4th order and greater).
	Off-Channel Habitat	Fish have unrestricted access to off-channel habitats (such as oxbows, off-channel ponds, backwaters, and areas of low flow velocity and cover) in unconstrained reaches during high flows and flooding events in winter. And these off-channel areas are relatively undisturbed by dikes, levees, dredge tailings, roads, excavations, fills, flow diversions, development, vegetation clearing, wood removal, poor water quality, etc.	Fish access to off-channel habitats, and the quantity and quality of off-channel habitats, in unconstrained reaches, is diminished due to dikes, levees, dredge tailings, roads, excavations, fills, flow diversions, development, vegetation clearing, wood removal, poor water quality, etc.	Fish access to off-channel habitats in unconstrained reaches is severely restricted or impossible due to dikes, levees, dredge tailings, roads, excavations, fills, flow diversions, development, etc., and/or the quality of the off-channel habitats is poor due to vegetation clearing, wood removal, poor water quality, and the other factors listed above. .

Klamath National Forest Tributaries Table of Pathways and Indicators:

Pathways	***Indicators***	***Properly Functioning***	***At Risk***	***Not Properly Functioning***
Habitat Elements:	Refugia (important remnant habitat for sensitive aquatic species)	Critical habitats necessary for successful completion of all anadromous salmonid life history phases (spawning, incubation, emergence, freshwater rearing, and migration) are functioning, accessible, and well-distributed. Critical summer refugia in Klamath Mountain streams include: (1) thermal refugia and (2) anadromous stream reaches with intact riparian reserves, cool clean water, pools that are not filled-in or partially filled-in with excess sediment, adequate stream flows, and good water quality. Critical winter habitat for anadromous salmonids includes side channels, off-channel habitats, and floodplain habitats.	Not all critical habitats necessary for successful completion of all anadromous salmonid life history phases are functioning and/or accessible for salmonids and/or well-distributed. Habitat quality and/or accessibility is diminished due to dikes, levees, dredge tailings, other fills, roads, excavations, flow diversions, development, vegetation clearing, wood removal, poor water quality, etc.	Many of the critical habitats necessary for successful completion of all anadromous salmonid life history phases are not functioning and/or not accessible for salmonids, and are thus are poorly distributed across the stream network and not providing adequate biological connectivity.
Channel Condition and Dynamics:	Width/Depth Ratio **(6)**	Width-to-Depth ratio < 12 on all reaches that could otherwise best be described as 'A', 'G', and 'E' channel types. Width-to-Depth ratio > 12 on all reaches that could otherwise best be described as 'B', 'F', and 'C' channel types. No braided streams formed due to excessive sediment loads. Lacking data, width-to-depth ratio should be evaluated considering the following factors: (1) recent (last 20 years) history of debris flows that have scoured channel and resulted in aggradation or degradation of the stream bed, (2) recent history of mass wasting that delivered large volumes of sediment to the stream that may have filled in pools, (3) pool frequency and depth information from stream surveys, (4) watershed disturbance as estimated with CWE modeling for mass wasting (GEO) and peak flows (ERA/TOC), and (5) frequency of large woody debris in the stream channel. For properly functioning, stream crossing density is low, there have been few mass wasting events caused by management actions, there are numerous deep pools, modeled mass wasting and surface erosion is low, and there is adequate LWD. If there is no or little management disturbance legacy in a watershed, then width-to-depth ratio is assumed to be properly functioning.	More than 10% of the reaches are outside of the ranges given for Width/Depth ratios for the channel types specified in "Properly Functioning" block. Braiding has occurred in some alluvial reaches as a result of excessive aggradation due to high sediment loads. For at-risk, stream crossing density is moderate to high, there have been some mass wasting events caused by management actions, pool frequency and quality is at-risk, modeled mass wasting and surface erosion is moderate to high, and there is inadequate LWD.	More than 25% of the reaches are outside of the ranges given for Width/Depth ratios for the channel types specified in "Properly Functioning" block. Braiding has occurred in many alluvial reaches as a result of excessive aggradation due to high sediment loads. For not properly functioning, stream crossing density is high, there have been some large mass wasting events caused by management actions, pool frequency and quality is poor, modeled mass wasting and surface erosion is moderate to high, and there is inadequate LWD.

Klamath National Forest Tributaries Table of Pathways and Indicators:

Pathways	***Indicators***	***Properly Functioning***	***At Risk***	***Not Properly Functioning***
	Streambank Condition (AP)	> 80% of any stream reach has ≥ 90% stability. Most watersheds have no bank stability surveys data so the level of streambank stability should be evaluated by considering: (1) density of road-stream crossings per stream or stream reach, (2) amount of inner gorge road, (3) other clearing and/or compaction directly adjacent to the stream, (4) artificial banks created by pushing up berms, and (5) recent (since 1996) channel altering debris flows. For properly functioning: Stream crossing density is low to moderate, there is little to no inner gorge road, there is no or only minor disturbance next to the stream channel, there are few or no berms, dikes, or levees constraining the channel, and/or there has been no or minor channel alteration/filling due to debris flows/landslides related to past management actions.	50-80% of any stream reach has ≥ 90% stability. For at-risk: Stream crossing density is moderate to high, there is some inner gorge road, there is some disturbance next to the stream channel, there are some berms, dikes, or levees constraining the channel, and/or there has been some channel alteration/filling due to debris flows/landslides related to past management actions.	< 50% of any stream reach has ≥90% stability For not properly functioning: Stream crossing density is high, there is over a mile of inner gorge road, there is significant disturbance next to the stream channel, berms, dikes, or levees constrain over a mile of channel; and/or there has been significant channel alteration/filling due to debris flows/landslides related to past management actions.
	Floodplain Connectivity (AP)	Off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation, and succession.	Reduced linkage of wetland, floodplains, and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation/succession.	Severe reduction in hydrologic connectivity between off-channel, wetland, floodplain, and riparian areas; wetland area drastically reduced and riparian vegetation/succession altered significantly.
Flow / Hydrology:	Change in Peak/Base Flows **(7)**	Properly functioning watersheds for peak flow have low modeled ERA/TOC, low road density, few large clearings in the rain-snow transition zone, and vegetation close to reference condition. Properly functioning watersheds for base flow have low modeled ERA/TOC, low road density and hydrologic connectivity, and vegetation close to reference condition.	Watersheds at-risk for change in peak flow have moderately high to high modeled ERA/TOC, moderate to high road density, and/or some large recent clearings in the rain-snow transition zone. Watersheds at-risk for change in base flow have denser vegetation compared to reference conditions, several water diversions, and moderate density of roads that have hydrologic connectivity.	Watersheds not properly functioning or change in peak flow have high modeled ERA/TOC, high road density, and may have large recent clearings in the rain-snow transition zone. Watersheds not properly functioning for change in base flow have much denser vegetation compared to reference conditions, numerous or large water diversions, and high density of roads that have hydrologic connectivity.
	Increase in Drainage Network (AP)	Zero or minimum increases in active channel length correlated with human caused disturbance (e.g., trails, ditches, compaction, impervious surface, etc). The primary cause of drainage network increase in Klamath Mountain watersheds is hydrologic connectivity between the road system and the stream network.	Low to Moderate increases in active channel length correlated with human caused disturbance (e.g., trails ditches, compaction, impervious surface, etc).	Greater than moderate increase in active channel length correlated with human caused disturbance (e.g., trails ditches, compaction, impervious surface, etc).

Klamath National Forest Tributaries Table of Pathways and Indicators:				
Pathways	***Indicators***	***Properly Functioning***	***At Risk***	***Not Properly Functioning***
Watershed Condition <u>Indicators</u>				
Watershed Conditions:	Road Density and Location (AP)	Less than 2 miles per square mile.	Two to three miles per square mile.	Over 3 miles per square mile.
	Riparian Reserves – NW Forest Plan (AP) **(8)**	The riparian reserve system provides adequate shade, large woody debris recruitment, and habitat protection and connectivity in all subwatersheds, and buffers or includes known refugia for sensitive aquatic species (> 80% intact), and/or for grazing impacts; percent similarity of riparian vegetation to the potential natural community/composition > 50%.	Moderate loss of connectivity or function (shade, LWD recruitment, etc) of riparian reserve system, or incomplete protection of habitat and refugia for sensitive aquatic species (approx. 70-80% intact), and/or for grazing impacts; percent similarity of riparian vegetation to the potential natural community/composition 25-50% or better. Some past stand-replacement timber harvest or intense fire in RR, moderate road and landing density in RR, minor to moderate level of mining in RR, vegetation/fuels moderately departed from historic fuels conditions, species diversity and vegetation structure in stream buffers moderately altered from reference condition due to fire suppression and past timber harvest, and moderate modeled CWE values.	Riparian reserve system is fragmented, poorly connected, or provides inadequate protection of habitat and refugia for sensitive aquatic species (approx. less than 70% intact), and/or for grazing impacts; percent similarity of riparian vegetation to the potential natural community/composition is 25% or less. Extensive past stand-replacement timber harvest or intense fire in RR, high road and landing density in RR, moderate to high intensity of mining in RR, vegetation/fuels greatly departed from historic fuels conditions, species diversity and vegetation structure in stream buffers significantly altered from reference condition due to fire suppression and past timber harvest, and high modeled CWE values.
	Disturbance History/Regime	Frequency, duration, and magnitude of stochastic disturbance events are close to reference condition. The following factors should be considered in rating the Watershed Disturbance/Regime indicators: (1) overall watershed disturbance as determined through CWE modeling, (2) road density and location, (3) current impacts from past stand-replacing forestry, mining, and intense fires, (4) departure from historic fire regime, (5) departure from historic vegetation structure and composition, and (6) character of development on private property. For properly functioning, a watershed should have low CWE and road density (all models under “1” threshold), few impacts from past stand-replacement forestry or intense fire, are not significantly departed from historic vegetation/fuels condition and fire regime, and/or have low disturbance on private property.	In at-risk watersheds, frequency, duration, and magnitude of stochastic disturbance events are moderately departed from reference condition. At-risk watersheds have moderate to high CWE and road density (one or two models over “1” threshold), some significant impacts from past stand-replacement forestry or intense fire, are moderately departed from historic vegetation/fuels condition and fire regime, and/or have moderate disturbance on private property.	In not properly functioning watersheds, frequency, duration, and magnitude of stochastic disturbance event is significantly departed from reference condition. Not properly functioning watersheds have high CWE and road density (all models over “1” threshold), significant impacts from past stand-replacement forestry or intense fire, are significantly departed from historic vegetation/fuels condition and fire regime, and/or have significant disturbance on private properties.
Summary Integration of all species and habitat indicators effects	How do the effects to indicators affect each fish species and their habitat? Describe by species and by 7th and 5th field watersheds. See AP guidance. In addition to the narrative summary, use Summary Table in Tables required for BA/BE.			

Footnotes to Table Above: *Table of Population and Habitat Indicators For Use on the Klamath National Forest in the Northwest Forest Plan Area, as adjusted from Appendix A in the Analytical Process.*

1) (Temperature) Proper Functioning criteria for 4th -5th Order streams is derived from temperature monitoring near the mouth of streams of relatively undisturbed watersheds (Clear, Dillon, and Wooley Creeks). –Maximum Weekly Maximum Temperatures (MWMT) as high as 70.5 degrees F have been recorded on these streams (EA Engineering, 1998 Salmon River and Dillon Creek Watershed Fish Habitat and Channel Type Analysis, Appendix 2). At-Risk criteria for 4th/5th order streams is derived from monitoring in streams that support populations of anadromous fish, although temperatures in this range (70.5 to 73.5 degrees F) are considered sub-optimal. The Not Properly Functioning criterion is sustained temperatures above 73.5 degrees F - that causes cessation of growth and approach lethal temperatures for salmon and steelhead. Properly Functioning criteria for 1st - 3rd order streams is derived from Desired Future Conditions (DFC) values given in the LRMP EIS p 3-68. At Risk and Not Properly Functioning criteria for 1st – 3rd order streams are assigned on a temperature continuum with values given for 4th/5th order streams, with the maximum instantaneous temperature of At Risk 1st - 3rd order streams coinciding with the minimum MWMT of 4th/5th order At Risk streams. [Stream Order according to Strahler (1957).]

(2) (Chemical/Nutrient Contamination) For projects within the river corridors of the mainstem Scott, Salmon, and Klamath Rivers the criteria is unchanged from AP Table. For tributaries to the Scott, Salmon, and Klamath Rivers use the criteria from the AP table. Although these tributaries have CWA 303d designation, Klamath National Forest tributaries are typically properly functioning for dissolved oxygen, nutrients, and microcystin, and because temperature and sediment is assessed in the Temperature and Substrate Character Indicators. Chemical contamination and nutrients should be assessed for Scott, Salmon, and Klamath River tributaries.

(3) (Substrate Character) Use recent stream survey data where available. Properly Functioning criteria for % fines in gravel is from the LRMP EIS p 3-68. Additional Forest-wide desired conditions for sediment (pool sediment, subsurface sediment) are described by Laurie and Elder (2012) in relation to monitoring for TMDL and NCRWB water quality standards. When location-specific information is unavailable, use the following as best appropriate: use USLE and GEO models to determine functioning level of Indicator and potential effects of sediment delivery to streams that may affect anadromous fish and their habitat, infer substrate character functioning level from other factors such as high road density and degree of hydrologic connection, recent large intense wildfires, and recent (last 20 years) debris flows that altered channels, and lastly use professional judgment to describe existing conditions and to estimate effects based upon model output interpretation, research results, or other information. The KNF CWE modeling procedure describes the risk (probability) of project-caused sediment production (see 2004 CWE process paper, by Elder and Reichert, in fisheries sufficiency guides). For existing condition and effects of the action:

1. Properly Functioning: USLE and GEO values are less than 1.0
2. At Risk: USLE and GEO values are between 1.0-1.20
3. Not Properly Functioning: USLE and GEO values are greater than 1.20

(4) (Large Woody Debris) See KNF LRMP EIS Chapter 3, text and tables on Pages 68-69. For stream reaches on the Westside of the Forest, manage for an average of 20 pieces of large wood per 1,000 ft in 3-5th order streams (LRMP Page 4-143). Large wood is defined as a minimum length of 50 feet and diameter of 24 inches on the Westside. However, site potential and channel width must be considered rather than using strict numbers. Also consider the potential for future LWD recruitment in both the short- and long-term.

Criteria for length of LWD for larger streams may be based on average bankfull channel width of the reach: in streams larger than 3rd order a piece of woody debris may qualify as large woody debris in a stream reach if its length is 1.5 times the average bankfull channel width, or if it has a rootwad attached and its length is 1¼ times the average bankfull channel width. Stable pieces of woody debris remain stationary during normal to high flows. Channel width and depth largely determines whether large woody debris recruited into a stream reach will be stable, and largely determines the average size of wood retained in streams (Bilby and Ward 1989, 1991; Robison and Beschta 1990). As channels become wider and deeper, the average size of a stable piece of wood increases. Pieces shorter than bankfull width and with a diameter less than bankfull depth are more likely to be transported out of a reach by streamflow (Bilby 1984, Braudrick et al. 1997). Length of woody debris appears to be most important to its stability where stream discharge is sufficient to float large diameter stems (Bilby 1985, Swanson and others 1984). Branches and/or rootwads, if still attached, add to the stability of woody debris. Therefore, criteria for length of LWD for larger streams may be based on average bankfull channel width of the reach: in streams larger than 3rd order a piece of woody debris may qualify as large woody debris in a stream reach if its length is 1.5 times the average bankfull channel width, or if it has a rootwad attached and its length is 1¼ times the average bankfull channel width.

(5) (Pool Quality and Frequency) A measurable pool is an area of channel which (1) shows clear signs that the pool was created by scour at high flows and/or that the pool is the result of the channel being dammed at the downstream end; (2) has a significant residual depth - the deepest part of the pool must be at least twice as deep as the water flowing out of the pool at the riffle crest; (3) has an essentially flat water surface during low flow - water surface slope <0.05 percent; and (4) includes most of the channel - it must include the thalweg and occupy at least half of the width of the low-flow channel. “Primary” pools are defined by their maximum depth in relationship to size or stream order. As the order or size of the stream increases the required minimum depth for a primary pool increases. In 1st through 3rd order streams, a primary pool must have a minimum depth of two feet or greater. In 4th and 5th order streams, a primary pool must have a minimum depth of three feet. In 6th order and larger streams, a primary pool must have a minimum depth of four feet.

(6) (Width/Depth Ratio) The Width-to-Depth ratio for various channel types is based on delineative criteria of Rosgen (1996). Properly Functioning means that Width-to-Depth ratio falls within expected channel type as determined by the other four delineative factors (entrenchment, sinuosity, slope, and substrate). Aggradation on alluvial flats causing braiding is well known phenomenon that often accompanies changes in Width-to-Depth ratio as watershed condition deteriorates. Stream width is a function of streamflow occurrence and magnitude, size and type of transported sediment, and the bed and bank materials of the channel (Rosgen 1996). Channel widths generally increase with flow volume downstream. Channel widths can be modified by changes in riparian vegetation, landslides particularly debris flows, changes in streamflow regimes, and changes in sediment supply. The AP Table indicates that confined or entrenched channel types (such as A, G, and E types) are Properly Functioning when Width-to-Depth ratios are <12, and wider channel types (such as B, C, and F types) are Properly Functioning when Width-to-Depth ratios are >12. To meet the Properly Functioning criteria channels must also have no or minimal braiding due to excessive sediment.

(7) (Peak/Base Flows) In most cases, sufficient hydrograph data is not available to determine comparative changes in peak flows as suggested in the AP. Infer changes in **peak flows** when no hydrograph data is available by considering the following factors: (1) CWE runoff model (ERA/TOC) outputs, (2) road density and the degree of hydrologic connectivity between the road system and the stream network, and (3) number, size, and vintage of openings in the forest canopy resulting from past stand-replacement forestry in the snow-rain transition zone where increased openings can result in elevated runoff from rain-on-snow events. The potential for decreased **base flows** in the Project HUC7 watersheds should be evaluated by considering the following factors: (1) increased/decreased evapotranspiration due to denser/sparser vegetation than reference condition that has resulted from stand-replacement forestry and/or fire suppression, (2) number and size of water diversions, and (3) degree of hydrologic connectivity between the road system and the stream network (watersheds with high road density likely have reduced base flows due to impervious surfaces and groundwater interception in road cuts).

(8) (Riparian Reserves) The following factors should be considered in determining the condition of stream buffer (hydrologic) RR: (1) amount and age of past stand-replacement forestry or intense fire in stream buffers, (2) road and landing density in stream buffers, (3) mining in stream buffers, (4) departure from historic fire regime, (5) condition of riparian vegetation for providing shade, large woody debris, sediment-filtering, and nutrient cycling, and (6) the amount of overall disturbance in the watershed particularly as estimated by the peak flow (ERA) and mass wasting (GEO) models. The following two factors should be considered in determining the condition of geologic RR: (1) amount and age of past stand-replacement timber harvest and/or recent intense wildfire on geologic RR and (2) road and landing density on geologic RR.

APPENDIX D: ENVIRONMENTAL BASELINE AND PROPOSED EFFECTS CHECKLIST

Checklists for documenting environmental baseline and effects of proposed actions(s) on relevant indicators for

LAKE MOUNTAIN AND MIDDLE TOMPKINS ALLOTMENT MANAGEMENT PLAN PROJECT

Legend For Reference Information Used to Determine Baseline Conditions:

ND: No data
N/A: Not applicable
PJ: Professional judgment (M. Meneks – District Fish Biologist)
CDFW 2014: Passage assessment database query
CDOT 2013: California Department of California annual fish passage progress report (CDOT 2013)
Sed 2013: Sediment monitoring, KNF – 2009 to 2013 (USFS 2013a)
WQ 2012: Stream temperature monitoring, KNF – 2010 and 2011 (Laurie 2012)
HRC: Historic reference condition mapping for Thom-Seider Project (Creasy, *et al*. 2007)
Flood 1997: 1997 Klamath National Forest flood assessment (de la Fuente and Elder 1997)
WA 2000: Lower Scott Ecosystem Analysis (USFS 2000)
WA 1999: Thompson/Seiad/Grider Ecosystem Analysis (USFS 1999)

CDFW 2014: 2013 Scott River studies final report (Knechtle and Chesney 2014)
CDFW 201l: Outmigrant screw trap data for Scott River, 2010 (Daniels, *et al*. 2011)

CWE: CWE data by watershed (see Table 5 in document text)

Temps: Summer temperature data (2010 – 2013) – O'Neil Creek, Grider Creek, Tompkins Creek, Scott River

O'Neil 2007: O'Neil Creek survey data – 2007 (unpub. data)
USFS 2013: Tompkins Creek pool analysis (USFS 2013b)

CA-EPA: http://www.swrcb.ca.gov/northcoast/water_issues/programs/tmdls/303d/

Table of Pathway and Indicators for 7th Field Watershed: Tompkins Creek

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature[1]	WQ 2012; Temps				X	
Suspended Sediment - Intergravel DO/Turbidity[1]		Sed 2013; WA 2000; CWE; PJ			X	
Chemical Contamination/ Nutrients	PJ				X	
Habitat Access Physical Barriers	CDFW 2014; PJ				X	
Habitat Elements Substrate Character and Embeddedness[2]		Sed 2013; CWE; PJ			X	
Large Woody Debris[2]			WA 2000; PJ		X	
Pool Frequency and Quality		USFS 2013; PJ			X	
Large Pools						
Off-channel Habitat	PJ				X	
Refugia	PJ				X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth	WA 2000				X	
Streambank Condition		PJ			X	
Floodplain Connectivity	PJ				X	
Flow/Hydrology Change in Peak/Base Flows[1]		PJ			X	
Increase in Drainage Network		PJ			X	
Watershed Conditions Road Density & Location		Sed 2013; WA 2000			X	
Disturbance History & Regime[3]		WA 2000; PJ			X	
Riparian Reserves - Northwest Forest Plan[1]		WA 2000; PJ			X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of recent data to compare to older, the trend for anadromous fish in this drainage is unknown. See Life History section for additional information			See Env. Conseq. and Table 8 for an Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1]Indicator potentially affected by 2014 Happy Camp Complex fire. Baseline not expected to change (PJ).
[2]Indicator potentially affected by fire. Baseline may change, but will require one or more years of monitoring and/or observation to determine if necessary to alter baseline.
[3]Indicator affected by fire. Baseline may or may not have been altered compared to pre-fire.

Table of Pathway and Indicators for 7th Field Watershed: O'Neil Creek

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature[1]	Temps				X	
Suspended Sediment - Intergravel DO/Turbidity[2]		O'Neil 2007; CWE			X	
Chemical Contamination/ Nutrients	EPA-CA				X	
Habitat Access Physical Barriers		CDFW 2014; CDOT 2013			X	
Habitat Elements Substrate Character and Embeddedness[2]		O'Neil 2007; CWE			X	
Large Woody Debris[2]		O'Neil 2007			X	
Pool Frequency and Quality		O'Neil 2007			X	
Large Pools						
Off-channel Habitat	N/A - Not present					
Refugia		PJ			X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth		O'Neil 2007; Flood 1997			X	
Streambank Condition	O'Neil 2007				X	
Floodplain Connectivity	PJ				X	
Flow/Hydrology Change in Peak/Base Flows[2]		PJ			X	
Increase in Drainage Network		PJ			X	
Watershed Conditions Road Density & Location			WA 1999		X	
Disturbance History & Regime[3]		Flood 1997; HRC; CWE			X	
Riparian Reserves - Northwest Forest Plan[2]	O'Neil 2007; WA 1999				X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of data, the trend for anadromous fish in this drainage is unknown. See Life History section for additional information			See Env. Conseq. and Table 8 for an Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1]Indicator potentially affected by 2014 Happy Camp Complex fire. Baseline not expected to change (PJ).
[2]Indicator potentially affected by fire. Baseline may change, but will require one or more years of monitoring and/or observation to determine if necessary to alter baseline.
[3]Indicator altered to reflect post-fire status. Baseline may or may not have been altered compared to pre-fire.

Table of Pathway and Indicators for 7th Field Watershed: Macks Creek

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature	No data available				X	
Suspended Sediment - Intergravel DO/Turbidity[2]	CWE				X	
Chemical Contamination/ Nutrients	EPA-CA				X	
Habitat Access Physical Barriers			CDFW 2014; PJ		X	
Habitat Elements Substrate Character and Embeddedness	No data available				X	
Large Woody Debris[2]	N/A for streams less than 3rd order, but is probably not properly functioning (WA 1999)				X	
Pool Frequency and Quality	No data available				X	
Large Pools						
Off-channel Habitat	N/A - Not present					
Refugia			PJ (barrier)		X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth	No data available				X	
Streambank Condition	No data available				X	
Floodplain Connectivity	No data available				X	
Flow/Hydrology Change in Peak/Base Flows[2]	CWE; PJ				X	
Increase in Drainage Network	PJ				X	
Watershed Conditions Road Density & Location	WA 1999				X	
Disturbance History & Regime[3]	CWE; WA 1999				X	
Riparian Reserves - Northwest Forest Plan	No data available				X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of data, the trend for anadromous fish in this drainage is unknown. If anadromous fish are present in the creek, they would not be able to access Forest Service land due to highway culvert. See Life History section for additional information			See Env. Conseq. and Table 8 for an Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1]Indicator potentially affected by 2014 Happy Camp Complex fire. Baseline not expected to change (PJ).
[2]Indicator potentially affected by fire. Baseline may change, but will require one or more years of monitoring and/or observation to determine if necessary to alter baseline.
[3]Indicator altered to reflect post-fire status. Baseline may or may not have been altered compared to pre-fire.

Table of Pathway and Indicators for 7th Field Watershed: Rancheria Creek

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature	No data available				X	
Suspended Sediment - Intergravel DO/Turbidity[2]	CWE				X	
Chemical Contamination/ Nutrients	PJ				X	
Habitat Access Physical Barriers	CDFW 2014; PJ				X	
Habitat Elements Substrate Character and Embeddedness	No data available				X	
Large Woody Debris[2]	N/A for streams less than 3rd order, but is probably not properly functioning (WA 1999)				X	
Pool Frequency and Quality	No data available				X	
Large Pools						
Off-channel Habitat	N/A - Not present					
Refugia	PJ				X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth	No data available				X	
Streambank Condition	No data available				X	
Floodplain Connectivity	No data available				X	
Flow/Hydrology Change in Peak/Base Flows[2]	CWE; PJ				X	
Increase in Drainage Network	PJ				X	
Watershed Conditions Road Density & Location	WA 1999				X	
Disturbance History & Regime[3]		CWE			X	
Riparian Reserves - Northwest Forest Plan	No data available				X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of data, the trend for anadromous fish in this drainage is unknown. See Life History section for additional information			See Env. Conseq. and Table 8 for an Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1]Indicator potentially affected by 2014 Happy Camp Complex fire. Baseline not expected to change (PJ).
[2]Indicator potentially affected by fire. Baseline may change, but will require one or more years of monitoring and/or observation to determine if necessary to alter baseline.
[3]Indicator altered to reflect post-fire status. Baseline may or may not have been altered compared to pre-fire.

Table of Pathway and Indicators for 5th Field Watershed: Lower Scott River (Scott River)

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature			Temps		X	
Suspended Sediment - Intergravel DO/Turbidity		PJ			X	
Chemical Contamination/ Nutrients			CA-EPA		X	
Habitat Access Physical Barriers	CDFW 2014				X	
Habitat Elements Substrate Character and Embeddedness			PJ[1,2]		X	
Large Woody Debris			WA 2000		X	
Pool Frequency and Quality	No data available - likely altered due to historic mining practices				X	
Large Pools						
Off-channel Habitat		PJ[1]			X	
Refugia		PJ[1]			X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth	No data available - likely altered due to historic mining practices				X	
Streambank Condition			PJ[1,2]		X	
Floodplain Connectivity		PJ[1]			X	
Flow/Hydrology Change in Peak/Base Flows		PJ[1]			X	
Increase in Drainage Network		PJ[1]			X	
Watershed Conditions Road Density & Location		WA 2000			X	
Disturbance History & Regime		WA 2000, PJ[1]			X	
Riparian Reserves - Northwest Forest Plan		WA 2000; PJ			X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of data, specific trend for anadromous fish in this drainage is unknown. However, some sources are available to examine the general Scott River condition. (1) Screw trap data since 2000 suggests a steady to upward trend for Chinook smolts and steady to slightly down for steelhead smolts (CDFW 2011). (2) Run size estimate for spawning Chinook since 1978 is steady to slightly down (CDFW 2013). Recent trends for Coho are unclear, but overall the run is considered to be depressed. See Life History section for additional information			See Env. Conseq. and Table 8 for an Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1] This 5th-field watershed includes extensive private property within/without the Forest boundary. Historic resource use throughout the drainage, including dredging, has impacted the watershed, and agriculture and timber extraction continue on private. Therefore, while Forest Service, or inholdings within the boundary, may show properly functioning condition - for instance, all CWE models under "1" threshold (CWE 2012b) - the consideration of the *whole* 5th-field watershed suggest lower ratings. Data is largely lacking for private properties.

[2] Due to size of lower Scott River and extreme difficulty to survey, comprehensive datasets for physical attributes are not available.

Table of Pathway and Indicators for 5th Field Watershed: Seiad Creek-Klamath River (Grider Creek)

DIAGNOSTIC OR PATHWAY and INDICATOR	Environmental Baseline			Effects of the Action		
	PROPERLY FUNCTIONING	FUNCTIONING - AT RISK	NOT PROP. FUNCT.	RESTORE	MAINTAIN	DEGRADE
HABITAT:						
Habitat Quality Temperature[2]	WQ 2012; Temps				X	
Suspended Sediment - Intergravel DO/Turbidity[2]	Sed 2013; CWE				X	
Chemical Contamination/ Nutrients	EPA-CA				X	
Habitat Access Physical Barriers	CDFW 2014				X	
Habitat Elements Substrate Character and Embeddedness[2]	Sed 2013; CWE; WA 1999				X	
Large Woody Debris[2]			WA 1999		X	
Pool Frequency and Quality			WA 1999		X	
Large Pools						
Off-channel Habitat	N/A - Not present (WA 1999)					
Refugia	WA 1999; PJ				X	
Channel Cond & Dyn Average Wetted Width/Maximum Depth	WA 1999				X	
Streambank Condition	WA 1999				X	
Floodplain Connectivity	PJ				X	
Flow/Hydrology Change in Peak/Base Flows[2]	CWE				X	
Increase in Drainage Network	PJ				X	
Watershed Conditions Road Density & Location	Sed 2013; WA 1999				X	
Disturbance History & Regime[3]	CWE; WA 1999; PJ				X	
Riparian Reserves - Northwest Forest Plan[2]	WA 1999				X	
SPECIES AND HABITAT:						
Species and Habitat: Summary/Integration of all Species and Habitat Indicators		X			X	
	Due to lack of data, the trend for anadromous fish in this drainage is unknown. See Life History section for additional information			See Env. Conseq. and Table 8 for an Indicator effects summary. The Env. Conseq. section also describes effects to fish and their habitat. Project not cause adverse effects.		

[1]Indicator potentially affected by 2014 Happy Camp Complex fire. Baseline not expected to change (PJ).
[2]Indicator potentially affected by fire. Baseline may change, but will require one or more years of monitoring and/or observation to determine if necessary to alter baseline.
[3]Indicator altered to reflect post-fire status. Baseline may or may not have been altered compared to pre-fire.

Table of Pathway and Indicators for 5th Field Watershed: Seiad Creek-Klamath River (Klamath River)

A pathway and indicators table for Klamath River mainstem is not explicitly included for several reasons. First and foremost, the Klamath River is a very large system. As such, traditional surveys are very difficult to undertake; and, therefore, little specific habitat data exists of the type appropriate to use to fill out the table information. The presence of extensive private property also makes for difficult access. Additionally, the river is impacted by many legacy and on-going activities/facilities – for instance (not an exhaustive list) dredge mining (large- and small-scale), upstream dams, agriculture, State/County roads, timber harvest on private land – which are beyond the scope of control by the Forest Service. It is the professional judgment of the Fish Biologist that most indices for the Klamath River mainstem in the 5th-field watershed area are either at-risk or not-properly-functioning. Overall, the Forest Service's ability to measurably affect conditions of the Klamath River due to proposed Project actions is non-existent.

References:

California Department of Transportation (CDOT). 2013. Coastal anadromous fish passage assessment and remediation progress report - annual report to the legislature for annual year 2012. California Department of Transportation, Division of Environmental Analysis, Sacramento, CA. 12 p.

Creasy, M., Safford, H., and D. Schmidt. 2007. Draft historic reference condition mapping, Thom Seider Project, Klamath National Forest. Prepared by the Klamath National Forest and The Nature Conservancy.

Daniels, S., Debrick, A., Diviney, C., Underwood, K., Stenhouse, S., and W. Chesney. 2011. Final report Shasta and Scott River juvenile salmonid outmigrant study, 2010. Report #P071307. California Department of Fish and Wildlife, Northern Region, Yreka, CA. 97 p.

de la Fuente, J., and D. Elder. 1997. The Flood of 1997 Klamath National Forest, Phase 1 Final Report: November 24, 1998. Klamath National Forest, Yreka, CA. 66 p + appendices.

Knechtle, M., and D. Chesney. 2014. 2013 Scott River salmon studies final report. California Department Fish and Wildlife, Northern Region, Yreka, CA. 23 p.

Laurie, G. 2012. Draft stream temperature monitoring on the Klamath National Forest, 2010 to 2011. Klamath National Forest, Yreka, CA. 17 p.

USDA Forest Service (USFS). 2013a. Stream sediment monitoring on the Klamath National Forest, 2009-2012. Klamath National Forest, Yreka, CA. 18 p.

______. 2013b. Tompkins Creek pool analysis (2013). Salmon-Scott River Ranger District, Klamath National Forest, CA. 4 p.

______. 2000. Lower Scott Ecosystem Analysis. Scott River Ranger District, Klamath National Forest, Etna, CA. 156 p + appendices.

______. 1999. Thompson/Seiad/Grider Ecosystem Analysis. Happy Camp Ranger District, Klamath National Forest, Happy Camp, CA. 127 p + appendices.